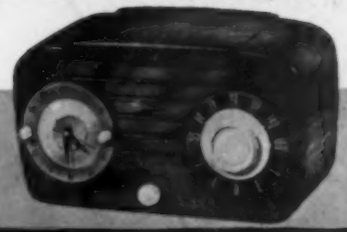
MODERN PLASTICS



APRIL 1949

It pays to use your custom molder's know-how

say Jewel Radio Executives



No. 4 in a Series on Plastics Skill at Work...





PROJECT:
Radio and Clock Cabinet

CUSTOMER:
Jewel Radio Corporation
New York, N. Y.

MOLDER:
Tech-Art Plastics Co.

MATERIAL:
Mottle-Finish Durez
Phenolic Plastic

CHANGING HOLE LOCATIONS on the bottom of the cabinet was required for various production runs. Tech-Art's solution was to use modern multihead drills instead of a cam action mold.

HIGH RATE OF PRODUCTION was achieved for this customer by using semi-automatic compression presses and Thermall electronic pre-heating equipment in molding the Durez plastic cabinets.

● "How many can we turn out...how fast?" An experienced custom molder sitting in at your planning councils can often raise the number that you'd get otherwise.

The Jewel Radio Corporation showed Tech-Art Plastics Co. the sketches of a new radio and clock cabinet. Fast work was urgently wanted...and the finished cabinet weighing almost two pounds would need a rather large mold.

Despite this, Tech-Art engineers offered constructive suggestions, designed the mold, recommended a general-purpose Durez phenolic plastic, and went into production within 10 weeks.

When a second mold and production line method were put into operation, the molder produced at the unusually high rate of 1800 cabinets per day. This schedule of deliveries is being held month after month on a seven-day-week basis.

Since the success of any part depends on the material used in it, Durez field technicians often team up with molders and customers in product planning.

We'll gladly serve you...and our experience as phenolic specialists covers the entire history of the industry.

A new hit with plastics users everywhere is the handy "Durez Check-Chart." Write for yours. Durez Plastics & Chemicals, Inc., 124 Walck Rd., N. Tonawanda, N. Y.

DUREZ

PHENOLIC RESINS

- MOLDING COMPOUNDS
- INDUSTRIAL RESINS
- PROTECTIVE COATING RESINS

PHENOLIC PLASTICS THAT FIT THE JOB



Catalin adds Color-Magic to the New Parker "51" *Magic Wand* Desk Sets

Here is a design for the Parker *Magic Wand* Desk Set that is daring in its simplicity! Shorn of all frills, clean-cut, massive and strong, it becomes the perfect masculine desk appointment. And to add the distinguished touch it is *beauty-based* on Catalin — the colorful, lustrous *gem of plastics*.

Catalin's inherent depth and richness of color enable it to fit naturally into the most luxurious surroundings. Like all fine things, it brings with it a pride in ownership and an aura of gracious living. Catalin in any of its forms — transparent, translucent or opaque — when adapted to radio cabinets, desk and table accessories and many other types of decorative items, gives them a charm . . . and a *desirability* that is irresistible.

Highly advanced Catalin casting techniques have broadened the horizon of designers and product engineers, permitting them to work freely in all three dimensions and bringing new flexibility to plastics applications.

Plan to add the distinguished and appealing touch of Catalin to your next new product idea. Our service staff will be glad to assist you. Inquiries invited.

CATALIN CORPORATION OF AMERICA
One Park Avenue • New York 16, N. Y.



CAST PLASTICS • LIQUID RESINS • MOLDING COMPOUNDS

MODERN PLASTICS*

VOLUME 26 APRIL 1949 NUMBER 8

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*Reg. U. S. Patent Office.

AT LAST... a jacket that laughs at the weather!

. . . Thanks to GEON polyvinyl resins

This reversible poplin jacket for golfers and other outdoor men has a lot extra on the ball!

Roomy around the shoulders, snug around the waist, it is a champion windbreaker that keeps you warm despite the weather—yet you enjoy this warmth with 40% less weight! That's because of the light but tough Geon resin film that lines the entire jacket. Reversed, this jacket keeps you dry even in the heaviest rain—thanks to Geon's amazing combination of qualities.

Many products have benefited from Geon's versatility — it beautifies kitchens, makes strong and handsome floors, wear-resistant upholstery, long-wearing raincoats—to mention but a few of its many uses. Perhaps these suggestions give you an idea to improve, cut costs, or even initiate a product! For Geon can be calendered, used for coating, extruding and film casting.

If we have suggested a new use for Geon polyvinyl resins, please let us know and we will send you full information on these remarkable materials.

We do not make any finished products from Geon but we are glad to give you full information and suggestions for its most profitable use. Write B. F. Goodrich Chemical Company, Dept. N-4, Rose Bldg., Cleveland 15, Ohio. In Canada: Kitchener, Ontario.



Complete reversible poplin jacket by the House of Timmons, Twinsburg, Ohio. Prestoflex Film Lining by Presto Plastic Products, New York, N. Y.

Geon Polyvinyl Materials

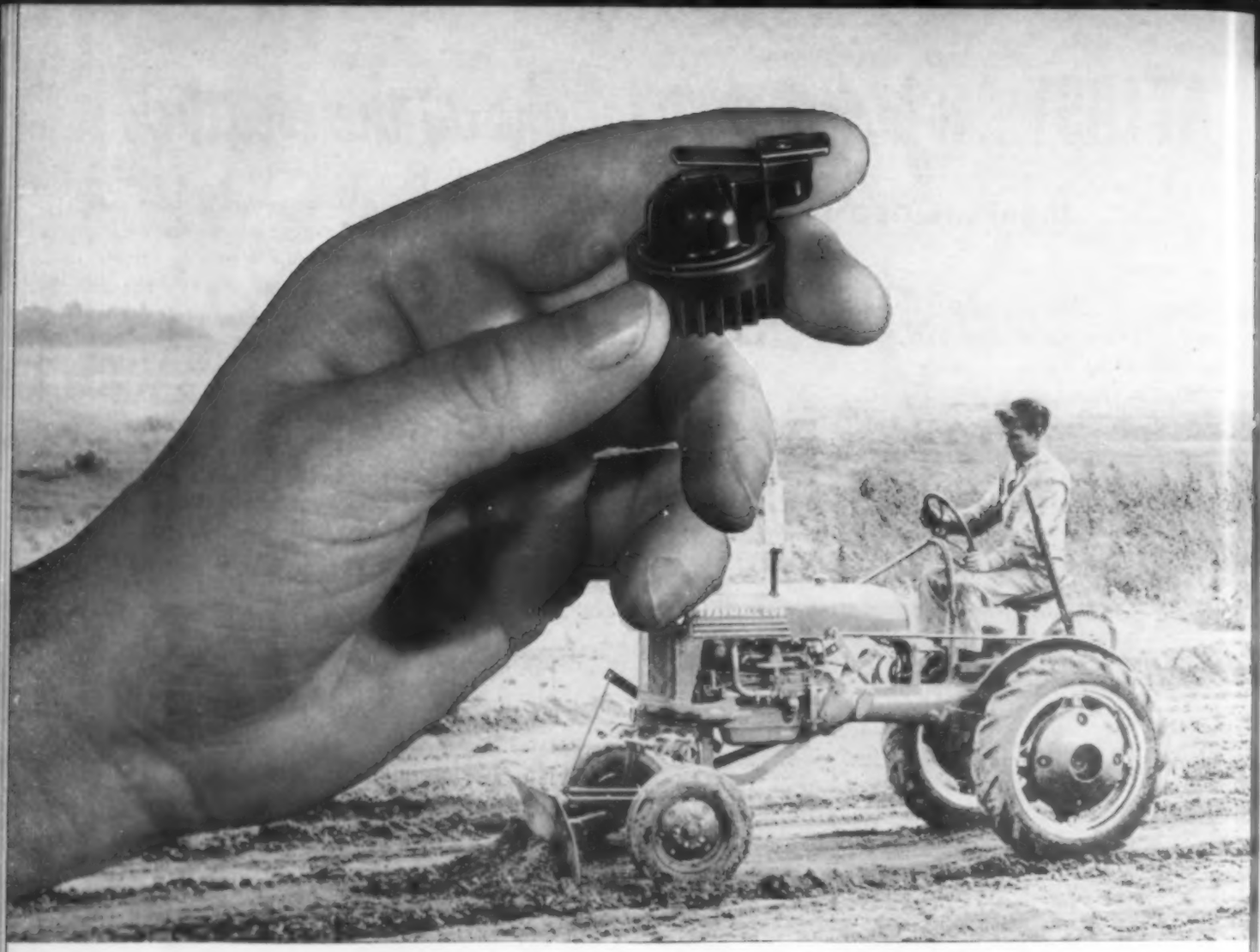
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Visit our Booths 310-A & B at the 18th National Packaging Exhibition.

B. F. Goodrich Chemical Company

A DIVISION OF THE B. F. GOODRICH COMPANY

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers



Chicago Molded Plastics — of course!

How to cut production costs without sacrifice of quality . . . that was International Harvester's problem in developing the rugged, dependable, but remarkably low-priced Farmall Cub tractor. One of the most interesting answers is this distributor rotor. By utilizing Chicago Molded Plastics, three vital parts were combined into a one-piece unit. Assembly was eliminated. Quality and performance were rigidly maintained. Yet the finished part shows a remarkable saving in cost.

Reducing costs without sacrificing quality is a rather common problem today. And today molded plastics are providing the answer in scores of cases like this one. The ability to produce complex parts in a single operation; to reduce or eliminate machining and assembly; and to remove the need for applied finishes, all combine to make this process preferred.

But . . . merely changing over to plastics is not enough. To achieve the desired results requires close familiarity with materials and their characteristics; complete knowledge of the molding process, its limitations and possibilities; and the resourcefulness and ingenuity to make sound use of the latest developments.

That's why so many leaders of industry have come to Chicago Molded for their important new developments. They know they will find here all the necessary equipment, a thoroughly seasoned organization with 30 years of experience, and complete engineering and product development facilities.

So . . . if you are seeking a way to reduce costs, perhaps you will find the answer in Chicago Molded Plastics. Whether you are merely planning or are ready for quotations, we invite you to talk it over with a Chicago Molded engineer. Write, phone or wire. There's no obligation.

CHICAGO MOLDED PRODUCTS CORPORATION

1046 N. Kolmar Ave., Chicago 51, Ill.

Representatives in principal industrial centers

COMPRESSION, INJECTION AND PLUNGER MOLDING OF ALL PLASTIC MATERIALS

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EDITORIAL

Conventions Need Planning

For better or worse, conventions have come to be accepted as permanent appendages of American business. Whether they are ornamental or utilitarian is another question. We favor the utilitarian type. A convention should be a business meeting where ideas can be exchanged between men with kindred interests. The day when conventions served solely as excuses for nectar sipping, tall story telling, and general carousing, is disappearing.

The plastics industry holds a great number of conventions —local, district, regional, and national. Scarcely anyone disapproves the idea of such meetings, but not everyone is happy about the benefits which accrue from them.

One of the foremost faults in many of the plastics industry's conventions is the repetition of speeches on subjects that have been discussed time after time. Such speeches serve only as a lullaby to the man who has been up late the night before or has just partaken of one of those customary sleep-provoking convention luncheons. There is no reason why this should be; surely there is no paucity of lively, sparkling subjects in this fast moving plastics industry. The subject doesn't even need to be a new development. There are plenty of practical problems, old and new, that are still far from solved. Lively discussions of many such problems would depopulate the cocktail rooms and start a run for the meeting room at any plastics gathering.

To make such discussions of greatest appeal requires planning—solid, forward planning coupled with a sense of the dramatic. There are few speakers who can really hold an audience on the edge of their chairs. Talks must be dramatized in one form or another, and the deadly screen chart isn't the answer. A good panel debate on the platform with several participants and a controversial subject is nearly always a guarantee of full attendance. An audience demands action, and if it isn't furnished from the platform, the audience should be permitted to take part. There have been several successful meetings of the audience-platform combination type in the past year, and we wonder why there aren't more.

Any convention can be only as fruitful as the planning behind it. And such planning takes time, thought, and hard work. The plastics industry needs a national convention program committee that works all year round—not just for a few weeks at a time—and that can spread the benefit of its work to local and regional committees.

Certain it is that top management will not take the time to attend numerous meetings where the same old chop is served over and over again. In an industry that's as full of meat as plastics, there is plenty from which to serve a fresh cut at every meeting.

INSUROK
by RICHARDSON

Dependable names in plastics

BIG ENOUGH--LITTLE ENOUGH

That's the way a friend recently spoke about the size of The Richardson Company.

His reasons are factors you may want to consider in selecting a supplier of plastics materials and services.

Here's how he put it:

BIG ENOUGH to have ALL of the facilities for big runs of (1) Laminated INSUROK sheets, tubes and rods, (2) punched parts, (3) fabricated parts and (4) Molded INSUROK products (molded of Durez, Plaskon, Melamine, Bakelite, etc.)

LITTLE ENOUGH to give personal and individual attention to EVERY customer and his problem.

Our size is just one of many factors that work in your favor when you turn to Richardson for plastics. Other important benefits are ready to go to work for you . . . such as experience, seasoned laboratory and production talent, competent production skills and a genuine interest in helping you improve your product and control production costs.

Why not discover for yourself what Richardson offers in the way of plastics materials and services?

INSUROK is a registered trade-mark of The Richardson Company

The RICHARDSON COMPANY

GENERAL OFFICES: LOCKLAND, OHIO FOUNDED IN 1858

Sales Headquarters: MELROSE PARK, ILLINOIS

CLEVELAND • DETROIT • INDIANAPOLIS • MILWAUKEE • NEW BRUNSWICK, (N. J.) • NEW YORK • PHILADELPHIA • ROCHESTER • ST. LOUIS

UNUSUAL NEW DU PONT PLASTIC USED IN VARIETY OF NEW PRODUCTS

Versatile polythene promises to play big part in future of American industry

Have you seen the new ice tray that releases its cubes at a twist of the wrist? Or have you seen those new *bottles* that spray out their contents when squeezed . . . and *won't break* when dropped?

These and hundreds of other fascinating new products are being made of Du Pont polythene . . . one of the most remarkable materials of modern chemistry.

Polythene molding powders are made in a wide range of colors by the Plastics Department of the Du Pont Company. Extruders, molders, and other processors convert the material into molded products, film, tubing, tape, filaments, etc.

In thin sections, polythene is tough and flexible. A new baby bottle made of polythene is soft, pliable, and strong. It needs no sterilizing. And it costs so little it *can be thrown away after use.*

In thick sections, such as pipe, polythene is relatively rigid. It resists most chemicals. As tubing it can be bent around corners, and rolled like a cable for easier handling.

During the war, polythene first came into use as an insulation material for high-frequency wire and coaxial cable. Since then it has found wide use in the electrical field. Current uses include jacketing for power cables and insulation for the coil in a new watt-hour meter.

Polythene's unusual combination of properties is especially useful in the packaging field. It can be heat-sealed. It keeps out water, dust, and bacteria. And it stays tough and strong at low temperatures . . . is tasteless, odorless, and nontoxic. Items now packaged in polythene include foods, cosmetics, corrosive chemicals, and metal parts.

Manufacturers are making more and more new products of all types with DuPont polythene. For polythene offers so many advantages at low cost—including ease of molding, extrusion and machining.

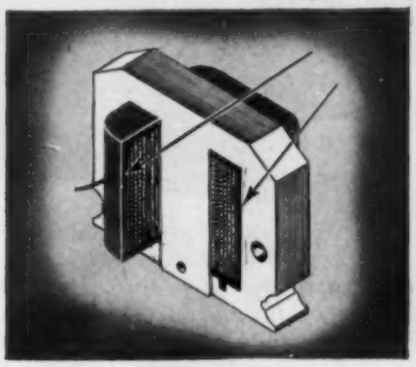
The demand for polythene still exceeds the supply, but continuing increases in production are being pushed to catch up with demand. More information on uses and specific properties of polythene can be obtained from E. I. du Pont de Nemours & Co. (Inc.), Plastics Department, Empire State Building, 350 Fifth Avenue, New York 1, N. Y.; 7 South Dearborn Street, Chicago 3, Illinois; 845 East 60th Street, Los Angeles 1, California.



APRON, pitcher, tumblers, ice-cube tray, ice tub, bowls, sugar bowl, cream pitcher and tablecloth protector are all made of Du Pont polythene. Names of manufacturers of items shown above available on request.



SQUEEZABLE BOTTLES, blow molded from polythene, package products ranging from cosmetics to corrosive chemicals. (Deodorant bottle molded by Plax Corp., Hartford, Conn., for Jules Montenier, Inc., Chicago.)



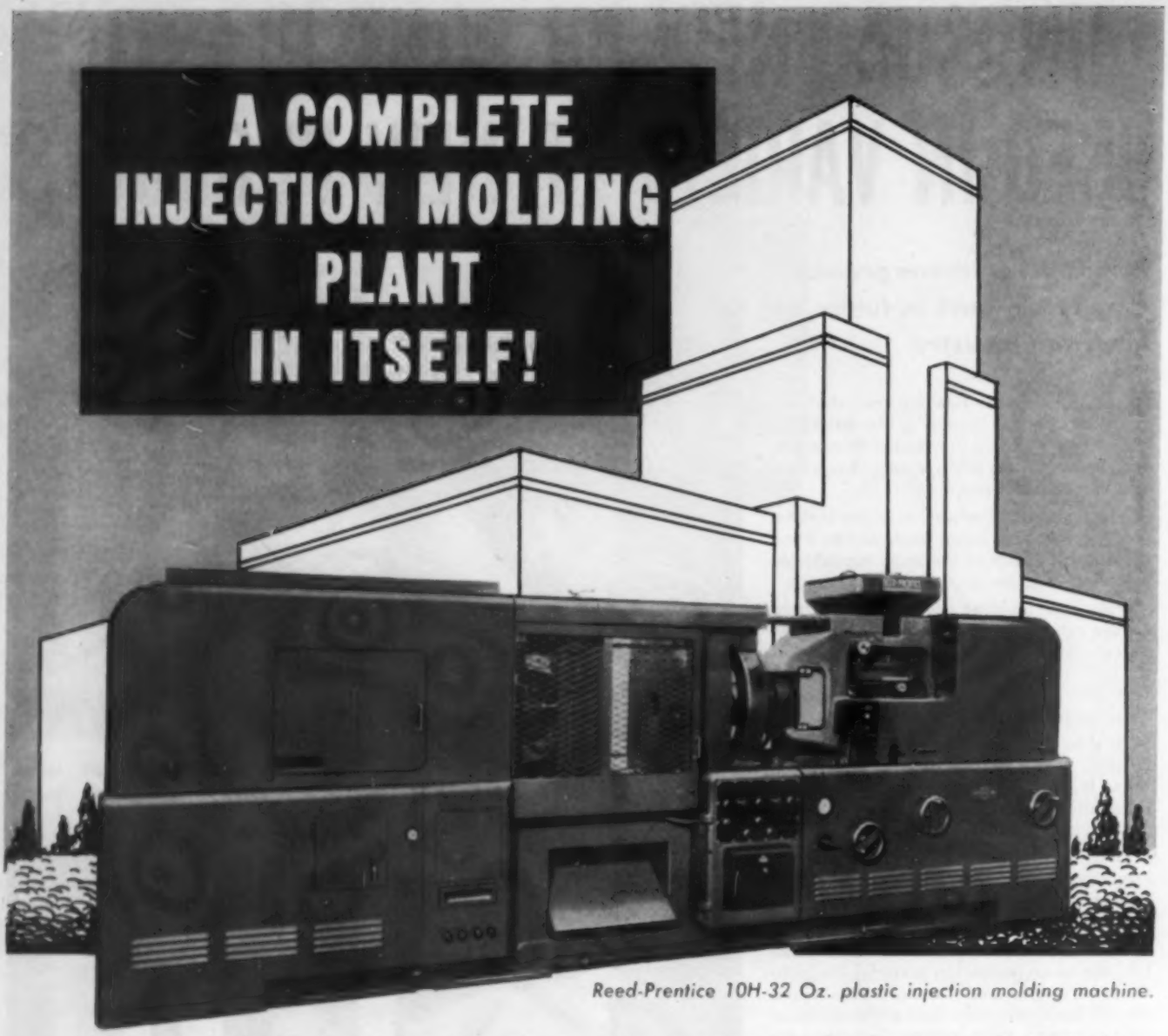
POTENTIAL COIL for new watt-hour meter is insulated with Du Pont polythene for greater strength, reliability and secure positioning. (Watt-hour meter manufactured by General Electric Co., Schenectady, N. Y.)



DISPOSABLE BABY BOTTLE made from Du Pont polythene extruded as continuous, flat, sterile tubing; heat-sealed to form 4- or 8-oz. sections. (Made by Shellmar Products Corp., Mt. Vernon, Ohio.)

DU PONT
REG. U.S. PAT. OFF.
Plastics
BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

A COMPLETE INJECTION MOLDING PLANT IN ITSELF!



Reed-Prentice 10H-32 Oz. plastic injection molding machine.

This injection machine is modern and complete . . . a plastic molding plant that is capable of large capacity shots from single cavity molds of considerable area or for quantity production runs from multiple cavity molds. The 10 H-32 Oz. machine has . . .

- **Sturdy frame construction**
- **Large capacity heating cylinder**
- **Convenient automatic controls**
- **Safety doors**
- **Automatic Lubrication**
- **Parts easily accessible for maintenance**

These are only a few of the outstanding 10 H-32 Oz. machine features that provide the injection molder with a complete, versatile plant for "profits in plastic".

Write us about your production problems, ask for detailed information on the 4, 8, 10, 12, 16, 24 or 32 Oz. capacity models. Address inquiry to Dept. D.

10 H-32 Oz. SPECIFICATIONS

Die locking pressure, tons	600
Max. casting area, sq. in.	210
Mold opens	16"
Max. die space	20"
Size: die plates	30" x 30"
Pressure psi on material	24,500

THE WORLD'S LARGEST MANUFACTURERS OF INJECTION MOLDING MACHINES

NEW YORK 6
75 West Street

CLEVELAND 13
1213 W. 3rd Street

INJECTION
REED-PRENTICE CORP.
WORCESTER MACHINES MASS., U.S.A.

LOS ANGELES 11
2314 Santa Fe Ave.

Have You Checked the Savings You Can Make

WITH CELANESE* EXTRUDED ACETATE SHEET?

Substantial savings are possible with the new Celanese extruded acetate sheet.

SAVINGS IN FIRST COSTS—Celanese extruded sheet sells for considerably less than acetate and nitrate sheet made by the old solvent or block method.

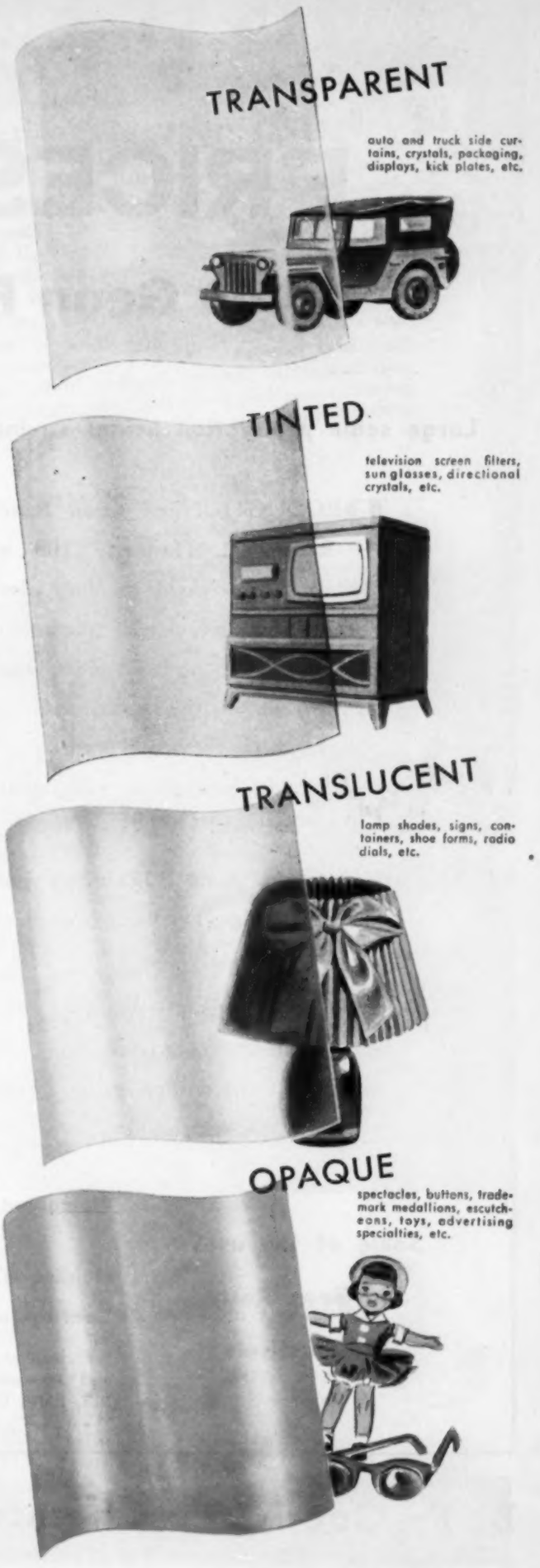
SAVINGS IN PRODUCTION—Celanese extruded sheet is supplied in a variety of widths and lengths—to fit your blanking out requirements, and reduce cutting waste.

SAVINGS IN INSURANCE—Celanese extruded sheet is rated non-hazardous by the Underwriters' Laboratories . . . requires no special handling and storage . . . reduces insurance premiums.

Celanese extruded sheet can be heat formed, drawn, blown, fabricated and cemented by all standard methods. It is available in thicknesses from .003" and up—in a range of colors: transparent, translucent and opaque. Get in touch with your Celanese representative for up-to-the-minute information on how you can adapt extruded sheet to your needs.
Celanese Corporation of America, Plastics Division, Dept. 1-D, 180 Madison Avenue, New York 16, N. Y.

A Celanese* PLASTIC

*Reg. U. S. Pat. Off.



PRICES DOWN

on Geon Paste Resin

Large scale production brings savings to all users of this versatile product

PRODUCTION on Geon Paste Resin 121 (formerly 100 x 210N) has increased to the point where we are able to pass substantial savings along to our customers. For many operations this means reduced manufacturing costs and makes plastisol coating competitive with other coating methods.

Geon Paste Resin 121 brings you many advantages in coating processes:

1. ECONOMY — Operations are simplified and costs reduced because no solvent or diluent is needed. Mixing time is cut down because of the close particle size control. Workable pastes are made within 1 to 2 hours in standard mixers. Film thicknesses up to 25 mils can be produced with only two passes on the coating machine.

2. LESS SHRINKAGE — The absence of solvent or diluent makes the fused coating especially smooth and attractive, the finished product essentially strain-free.

3. SAFETY — No toxic or inflammable solvent or diluent insures safer operation — eliminates fire hazard — and justifies a lower insurance rate.

Some of the uses for Geon Resin 121 Plastisols

Dip-coated articles — gloves, dish racks, plating racks and others.

Molding—toys and dolls, artificial fish lures, prosthetic devices.

Coating—textiles, paper, fiber-glass.

For complete information about Geon resin 121—prices, advantages, and uses—write or wire Dept. SN-4, B. F. Goodrich Chemical Company, Rose Bldg., Cleveland 15, Ohio.

B. F. Goodrich Chemical Company A DIVISION OF THE B. F. GOODRICH COMPANY

GEON polyvinyl materials • HYCAR American rubber • GOOD-RITE chemicals and plasticizers

"THEY CAN'T BE BEAT!"

That's what PLASTENE says about their seven H-P-Ms

Here's a custom molder, who in less than two years is really "going to town" with H-P-Ms. Polystyrene wall tiles, illustrated at left, are molded on a 22 second cycle by the thousands for Sears. This is typical of some of the high production output of their H-P-M machines.

Now is the time to capitalize on plastics. Molding materials are plentiful and H-P-M machines can be delivered promptly.

Here are some of the exclusive features which make H-P-Ms the best buy for your money .... full hydraulic clamp for quick and easy mold set-up .... accurate material feed .... ample plasticizing capacity .... dependable H-P-M hydraulic pumps, valves and controls. Check the complete specifications and you'll pick money saving H-P-Ms every time. Install H-P-Ms and you'll agree with Plastene —"they can't be beat"!

THE HYDRAULIC PRESS MFG. COMPANY

Mount Gilead, Ohio, U. S. A.

1010 Marion Road

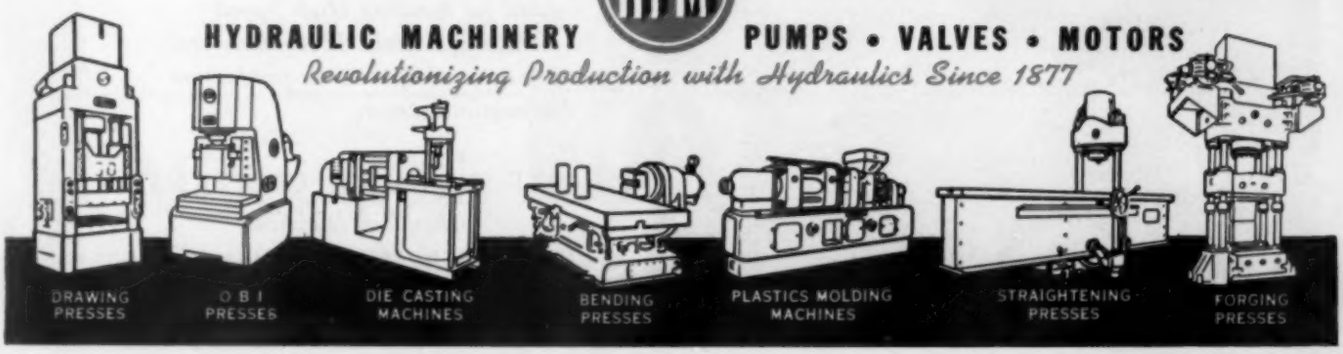


Write for a free copy of Bulletin 4802 describing H-P-M injection machines (4, 9, 16 & 40 oz. sizes).

HPM

HYDRAULIC MACHINERY PUMPS • VALVES • MOTORS

Revolutionizing Production with Hydraulics Since 1877



DURITE



- DURABILITY
- BONDING STRENGTH
- RESISTANCE TO HEAT
- RESISTANCE TO ABRASION
- TOUGHNESS AND RESILIENCY

. . . outstanding properties that make DURITE Phenolic Resins ideal for bonding High Speed Grinding Wheels. With them you are assured maximum production at minimum cost.

THE BORDEN COMPANY

Chemical Division

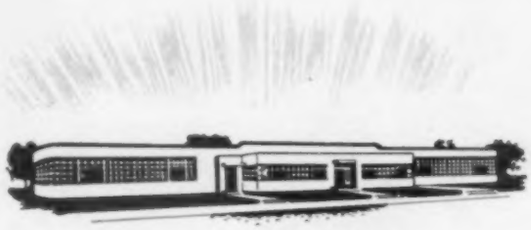
5000 SUMMERDALE AVE., PHILA. 24, PA.



MPM solves difficult design problems



MPM finds production economies



MINNEAPOLIS Plastic Molders have earned a *national reputation* among *national manufacturers* for a kind of service that goes far beyond mechanical skill. This unique service is built on deep-rooted experience—just as the MPM reputation is built on performance for some of the country's best known manufacturers.

MPM FACILITIES ARE COMPLETE • INDUSTRIAL DESIGN • MOLD AND DIE MAKING • HOBS AND HOBBING • COMPRESSION, TRANSFER, INJECTION MOLDING



MPM maintains quality and uniformity in molding



MPM assumes responsibility for the ENTIRE molding project

Minneapolis Plastic Molders, Inc.

Affiliated with the Pal Tool Company

4411 HIAWATHA AVE. • MINNEAPOLIS 6, MINN.

SHOOT *LARGER MOLDINGS* f
NEW WATSON-STILLMAN 48 oz. I

Another ***FIRST,*** bears the ***WATSON-STILLMAN*** trade-mark. It's the ***NEW*** Model 48E-1000 W-S Injection Molding Machine—largest standard type available . . . anywhere.

This latest advance in plastics machinery engineering will increase ***YOUR*** profits . . . give ***YOU*** a better competitive position, because it materially extends the size-range of products which can be molded in one piece by this process. Model 48E-1000 not only provides greater capacity over previous standards but permits production of items ordinarily produced in smaller machines at reduced cycles. This machine cuts labor costs, saves space, time and operating expense.

Incorporating the major features of the standard W-S "COMPLETELINE," this new unit includes many additional features engineered to assure a more efficient, profitable molding operation. To mention a few—its normal capacity (48 oz.) is increased 40-50% by an automatic stuffing arrangement. It utilizes a giant version of the W-S Heating Cylinder, known for its unusual record of near-capacity shots in such de-rating materials as styrene. The stainless steel hopper receives an entire barrel of material, which can be plasticized on automatic cycle at the rate of 200 lbs. per hour. Why say more?

Orders for 18 of these machines have already been placed. Let us tell you why leaders in the industry are rapidly adopting Model 48E-1000. A glance at the specifications gives one answer. However, write for Bulletin 620-F (with inserts) today, or, get in touch with our nearest representative for full details.

SPECIFICATIONS

Capacity of hopper	200 lbs.
Maximum feed	165 cu. in.
Maximum ounces per shot	48
Plasticizing capacity of cylinder per hour	200 lbs.
Speeds:	
Die Closing (Forward)	420 in. per min.
Die Closing (Return)	385 in. per min.
Injection (Forward)	160 in. per min.
Injection (Return)	210 in. per min.
Injection pressure	21,000 lbs. per sq. in.
Clamping capacity	1000 tons
Stroke of clamping ram	32"
Daylight opening	54"
Minimum die thickness	12"
Maximum die sizes	30" x 50"
Rated maximum power consumption of heat units	13 K.W.
Motor H.P.	60
Oil reservoir capacity	300 gals.
Floor space required	24'-6" x 4'-6"
Overall height	9'
Shipping weight	85,000 lbs.

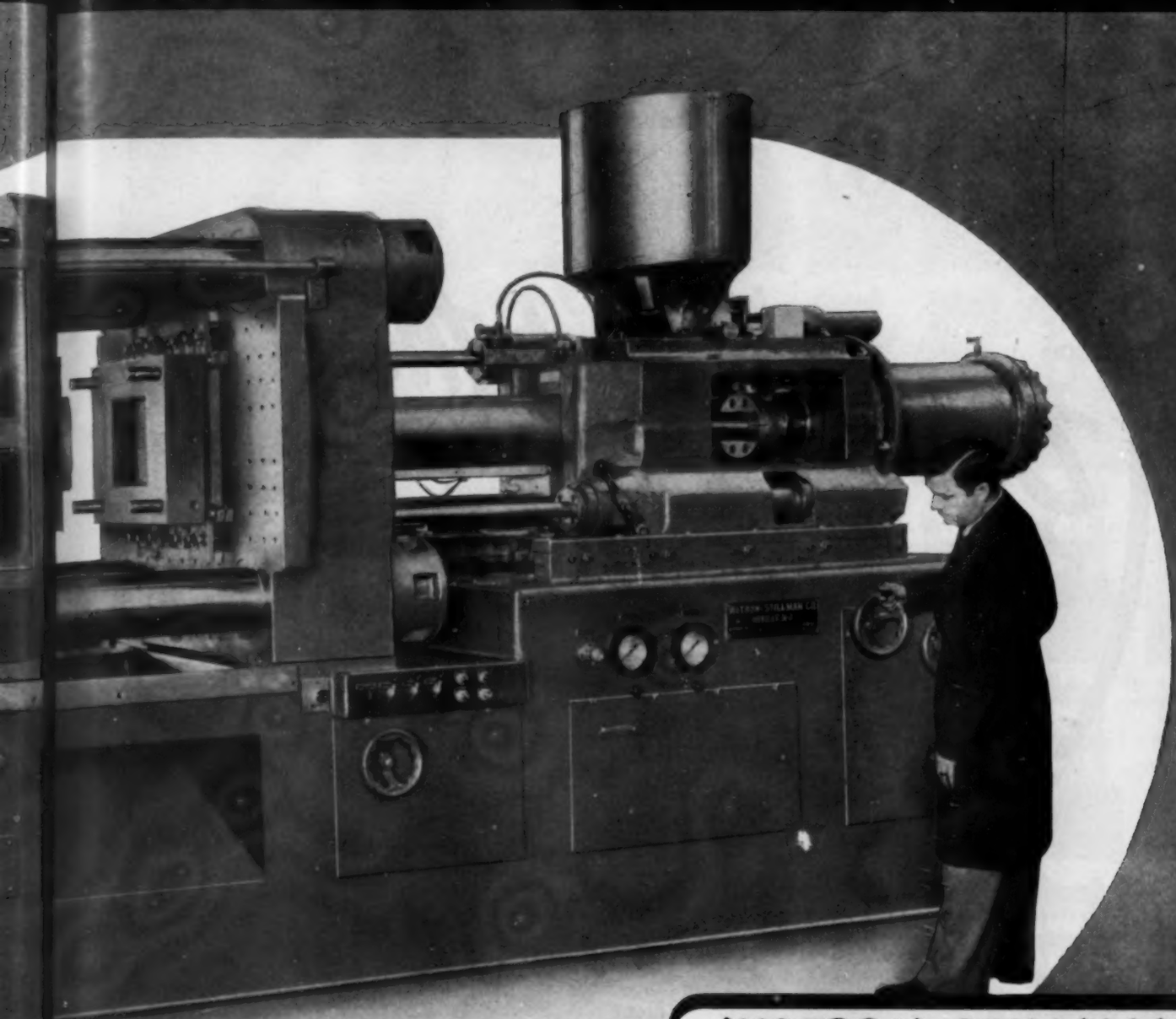


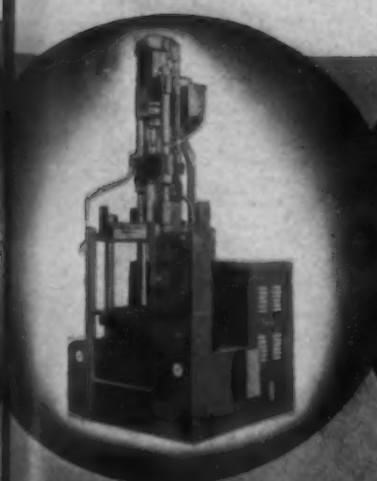
COMPRESSION MOLDING PRESSES 30 TO 1200 TONS

PREFORM TABLETING MACHINES —10 AND 100 TONS

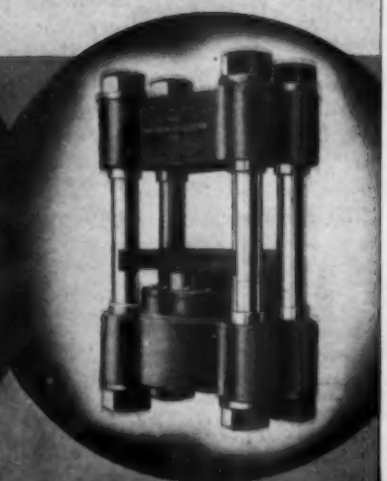
TRANSFER MOLDING MACHINES 30 TO 1200 TONS

S for BIGGER PROFITS with the z. INJECTION MOLDING MACHINE!





VERTICAL INJECTION MOLDING MACHINES—1, 2, AND 4 OUNCES



HOBBING PRESSES 200-3000 TONS

WATSON-STILLMAN

HYDRAULIC MACHINERY DIVISION

Established 1848

Factory and Main Office: Roselle, New Jersey
Branch Office: Chicago, Ill.

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THEY'RE compression molding presses at Norton Laboratories, one of America's great names in custom molding.

They mold plastic assemblies, subassemblies, parts and finished products for leaders in American industry . . . Helena Rubinstein, Kelvinator Division of Nash-Kelvinator Corporation, and many others.

The Norton men who tend them *know how.*

Norton engineers who help design products made on them *know how.*

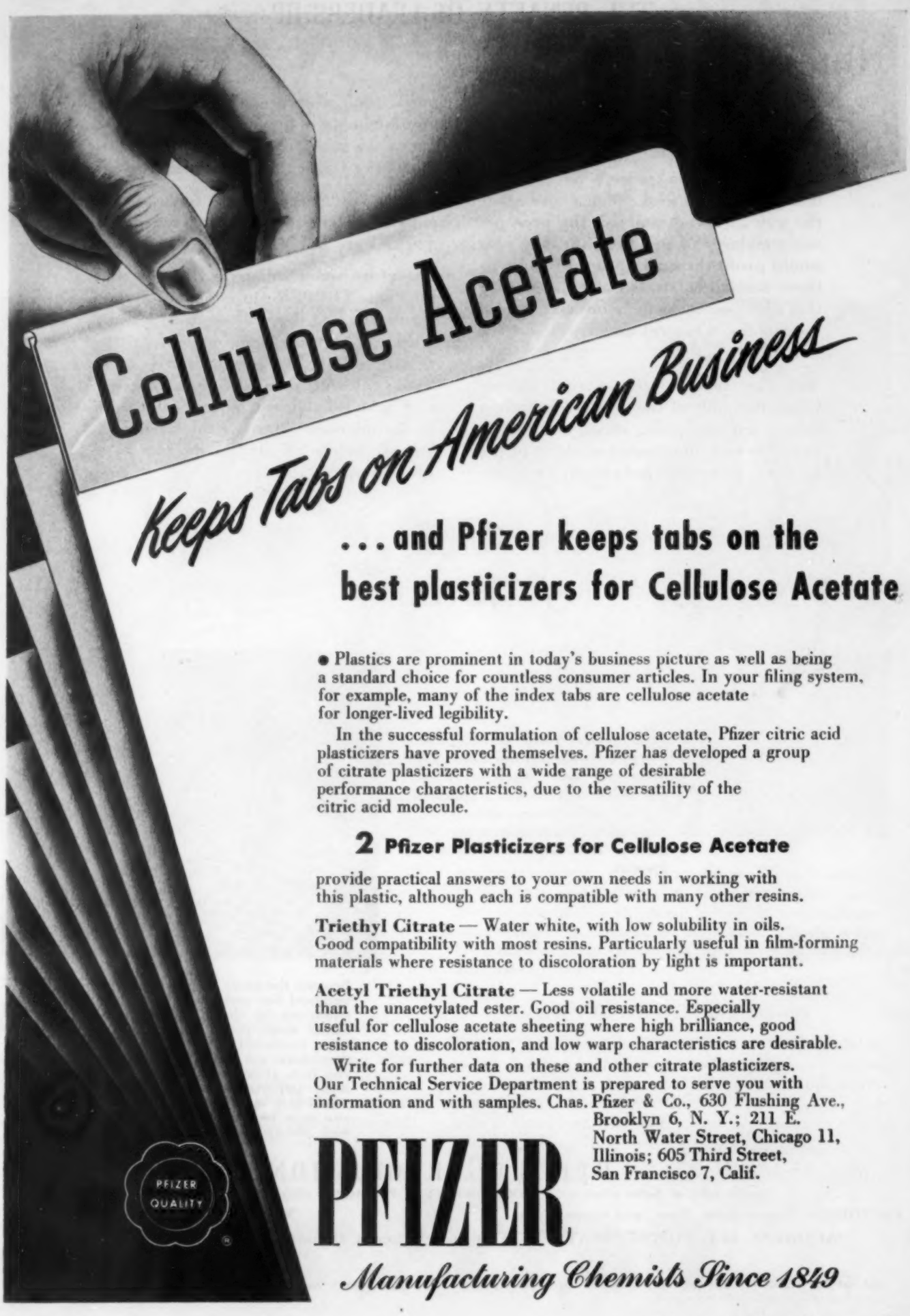
They're *your* presses . . . if you need plastic moldings made on presses worked by men who *know how.*

That goes for *injection* molding at Norton, too.

Put us to work now, without obligation on your part, on the preliminary spade work for your next molding assignment. Write to us, describing the job — we will respond promptly with design recommendations, price estimates and delivery dates . . . Or, if you prefer, ask a Norton *engineer* (that's right, not a salesman, but an *engineer*) to call on you for a free consultation. Norton Laboratories, Inc., Lockport, N. Y. Sales Offices: *New York — 347 Fifth Avenue; Chicago — 9 South Clinton Street.*

NORTON *Laboratories, Inc.*

COMPRESSION AND INJECTION MOLDING



. . . and Pfizer keeps tabs on the best plasticizers for Cellulose Acetate

● Plastics are prominent in today's business picture as well as being a standard choice for countless consumer articles. In your filing system, for example, many of the index tabs are cellulose acetate for longer-lived legibility.

In the successful formulation of cellulose acetate, Pfizer citric acid plasticizers have proved themselves. Pfizer has developed a group of citrate plasticizers with a wide range of desirable performance characteristics, due to the versatility of the citric acid molecule.

2 Pfizer Plasticizers for Cellulose Acetate

provide practical answers to your own needs in working with this plastic, although each is compatible with many other resins.

Triethyl Citrate — Water white, with low solubility in oils. Good compatibility with most resins. Particularly useful in film-forming materials where resistance to discoloration by light is important.

Acetyl Triethyl Citrate — Less volatile and more water-resistant than the unacetylated ester. Good oil resistance. Especially useful for cellulose acetate sheeting where high brilliance, good resistance to discoloration, and low warp characteristics are desirable.

Write for further data on these and other citrate plasticizers. Our Technical Service Department is prepared to serve you with information and with samples. Chas. Pfizer & Co., 630 Flushing Ave., Brooklyn 6, N. Y.; 211 E. North Water Street, Chicago 11, Illinois; 605 Third Street, San Francisco 7, Calif.

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PFIZER

Manufacturing Chemists Since 1849

THE PENALTY OF LEADERSHIP

Guardianship

Most difficult of the many penalties of leadership is the guardianship of standards.

To pattern after a leader is normal. For it is the leaders who pioneer and show the way . . . who establish the precepts and standards of practice. But they who would profit through lip service only, to those standards, steals but momentarily that which enriches them not and, denies the mantle of respect under which cover is furtively sought.

But, for that interim period during which the mills of the Gods are grinding slowly, and exceeding small, and the inexorable and inescapable working of the laws of reputable behaviour have imposed their sentences, it is hardly fair that the buyer of a product should invest under the mask of misapprehension so cunningly fabricated for his confusion.

So, certain deterents in the form of patents, copyrights, trade names and trade marks were devised.

Therefore when we stress the fact that the name TUPPER (in either of the two forms you see here) is at once a trade mark . . . a trade name and so say, in effect, "this is our pledge that we will keep faith with you", it is an acceptance and acknowledgment of our obligation to shoulder our share of the burden of guardianship of standards for your protection.

TUPPER

TUPPER!



This smart table setting with TUPPERWARE pictures a breakfast table that says "Good morning" and means it. This is as it appeared in the article "Housewares Award" to Tupper Corporation in the September 1948 edition of Modern Plastics.

Bearing the name TUPPER, are many items, designed for and accepted as, definite contributions to the American way of Life. These same pieces possess like attributes when employed in many services for which they were not originally designed. But if you feel, after discussion with our Development Department, that your requirements would best be served through specific design, you may be assured they will be endowed with identical values.

TUPPER CORPORATION

Manufacturers of better plastic — CONSUMER, INDUSTRIAL, PACKAGING AND SCIENTIFIC PRODUCTS

FACTORIES: Farnumsville, Mass., and Cuero, Texas **New York Show Rooms 225 Fifth Ave.**

ADDRESS ALL COMMUNICATIONS TO: Development Department D, CUERO, TEXAS

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Do not buy Plastic Products just as a substitute for something else. *Do buy them because they do so many jobs so much better.*

Have you tried

PLIOVIC

—that easier processing vinyl resin?

PLIOVIC mills at lower temperatures, handles easier.



Pliovic is a new vinyl chloride type copolymer, possessing superior processability. More efficient internal plasticization and a lower fusing temperature account for the desirable processing characteristics of this resin. Produced in a modern, up-to-date plant, **Pliovic** is available in two types:

PLIOVIC A—for vinyl products of quality

Pliovic A may be used alone or in combination with other vinyl resins—as a compounding agent—to give easier processing. It can be milled or Banbury mixed—calendered or extruded at lower temperatures and needs less plasticizer than copolymers of comparable molecular weight. High strength, excellent resistance to flex-fatigue, toughness at low temperatures have been maintained in this resin as well as good age and light stability and chemical resistance. **Pliovic A** has been use-proved in calendered films, flooring, extruded hose and tubing.

PLIOVIC AO—for organosols

For use in organosols, **Pliovic AO** can be formulated to give films of high strength and toughness, excellent clarity with lower fusing or heat sealing temperature requirements. Write for full details to Goodyear, Chemical Division, Akron 16, Ohio.

USE PROVED *Products*

We think you'll like "The Greatest Story Ever Told"—Every Sunday—ABC Network

GOODYEAR

Pliovic—T.M. The Goodyear Tire & Rubber Company

Announcement by *Colton*

THE goodwill, patents, inventory and certain assets of the Arthur Colton Company have been purchased by Snyder Tool & Engineering Company of Detroit which will operate the Colton Company as a subsidiary under the Colton name.

Operation will be transferred to the large, new Snyder plant where there is every modern facility for building fine machines for many fields of manufacturing and packaging.

Administration will be in the hands of an executive combination merging the specialized experience of the engineering, sales and manufacturing departments of the 65-year-old Colton Company with that of the 25-year-old Snyder Company in order to provide a service of outstanding worth to Colton clients throughout the world.

ARTHUR COLTON COMPANY

DETROIT, MICHIGAN

WINNERS HAVE WHAT IT TAKES



If you want your product to break the tape every time in the race for sales, mold it or fabricate it from a Nixon Cellulosic Plastic. You will find these plastics practical and economical to use . . . colorful and yet resistant to most of the ordinary enemies of plastic materials. Nixon C/N (Cellulose Nitrate) is available in sheets, rods, and tubes. Nixon C/A (Cellulose Acetate) and Nixon E/C (Ethyl Cellulose) are available in sheets, rods, tubes, and molding powder.

LIKE **NIXON PLASTICS**

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Representatives in Principal Cities • Chicago Office: 510 N. Dearborn Street, Chicago 10, Illinois

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HERE IS A 3-STEP PLAN for cutting processing costs

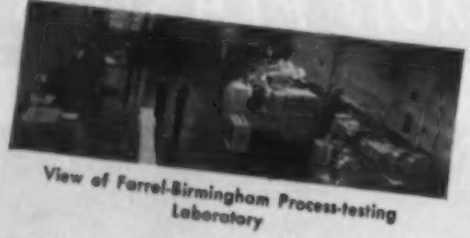
1

EXPLORE BY EXPERIMENT *the possibilities of new processing techniques.*

The Farrel-Birmingham process-testing laboratory provides the ideal spot for conducting such experiments.

Here, there are numerous pieces of modern equipment in both laboratory and production sizes. This equipment is designed to help work out processing techniques *before* beginning full-scale production. Interchangeable working elements for these machines, and a wide range of speeds and pressures, broaden the scope of their use, making a great variety of tests possible.

Farrel-Birmingham offers the private use of this laboratory and the assistance of its engineering staff, without obligation.



View of Farrel-Birmingham Process-testing Laboratory

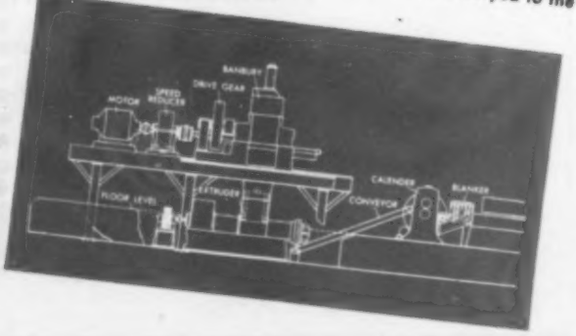
2

ENGINEER YOUR PLANT LAYOUT *to provide an efficient, continuous flow of production.*

For many years, Farrel-Birmingham has made a specialty of engineering complete processing setups. Developed from start to finish by company engineers, each of these layouts is composed of production machines *matched in capacity* to prevent the "choking" or "starving" of succeeding units. Production flows without costly interruptions and with manual aid and supervision reduced to a minimum.

The Farrel-Birmingham *Engineering Planning Division* is staffed by men with a background of many years of experience in solving processing problems for the rubber and plastics industries.

Setup especially designed for the production of blanks from which phonograph records are made. In operation the 12" extruder receives stock directly after it has been processed in a Banbury mixer. The extruder, which requires no operator, handles the full capacity of the Banbury. The stock is thoroughly worked by screw action under close temperature control, and the die head extrudes a strip which is conveyed to the calender and blanking unit.



3

SELECT EQUIPMENT *to suit needs exactly.*

Farrel-Birmingham production units are available in various sizes and with a wide choice of design features to meet specific requirements.

BANBURY MIXERS—First developed for the rubber industry where its use is virtually universal, the Banbury is now widely used with equal efficiency in the production of plastic materials such as phenolic condensation products, cellulose acetates, caseins, synthetic resins, vinyl chloride resins; also asphalt roofing and flooring, linoleum, paints and lacquers.

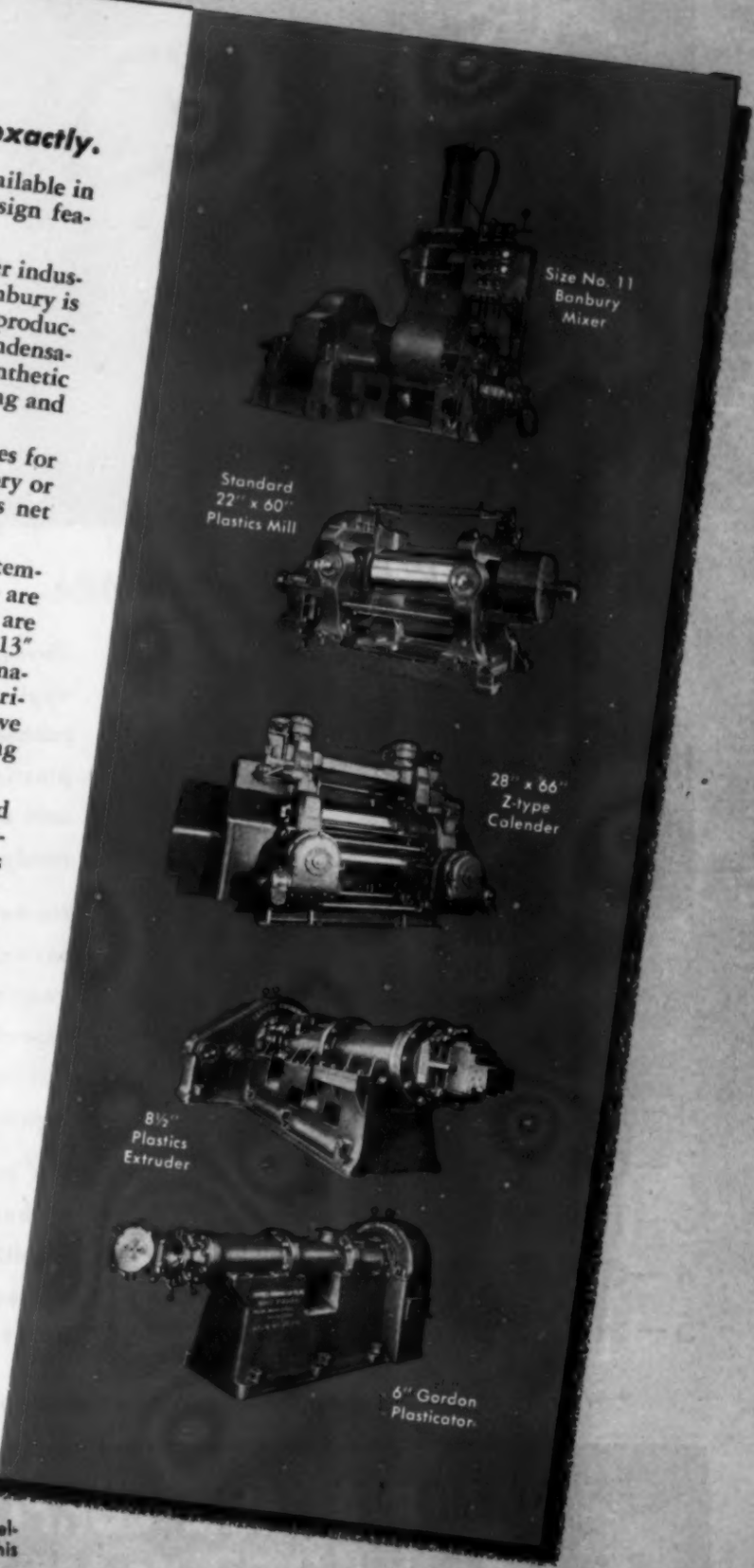
Banbury mixers are made in six standard sizes for processing plastics, from the size B for laboratory or small production work to the No. 11 with its net chamber capacity of 14,940 cubic inches.

MILLS — Farrel-Birmingham mills provide close temperature control and accurate gauge where these are required for processing synthetic materials. Mills are available in a complete range of sizes, from 6″ x 13″ for the laboratory up to 28″ x 84″ heavy duty machines for the factory. For special requirements, variations in design as well as a wide choice of drive arrangements are obtainable, often from existing plans.

CALENDERS—Farrel-Birmingham calenders are designed for the highly specialized work of calendering plastics, a continuous, high-speed operation that demands accurate control of gauge for satisfactory production. From the small laboratory units to the huge production sizes, the physical proportions, materials, type of construction, lubricating system, gearing, special operating features—in fact, every detail is designed to fit the job the calender is built to do. Calenders are available in both Z-type and inverted L-type constructions.

EXTRUDERS—Farrel-Birmingham extruders have "designed-in" features and construction to suit each machine for its particular function. They are built in a range of sizes from 6″ to 20″ for a variety of applications in processing plastics stocks.

Gordon plasticators, which are used for continuous mixing of the various powders or granules that go into numerous thermoplastics, are available in 6″, 8½″, 12″, 15″ and 20″ production sizes and a 3″ laboratory size.



Before you purchase new processing equipment, call in a Farrel-Birmingham engineer. He will be glad to give you the details of this 3-step plan for cutting processing costs.

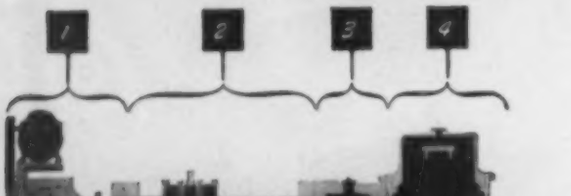
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Farrel-Birmingham



NATIONAL-ERIE *features* Sturdy Unit Construction



UNIT CONSTRUCTION

1—HEAD UNIT
2—CYLINDER UNIT
3—THRUST UNIT
4—GEAR REDUCTION UNIT
5—STOCK SCREW

Shown above is an 8½" NE Extruder. It has a wide application in processing natural and reclaimed rubber, plastic materials and extruding finished plastic shapes. Like all NE Tubers, it features heavy unit construction for long trouble-free service and ready accessibility for inspection.

No two applications are alike. Materials and processing speeds vary. NE engineers work closely with your engineers to get the best combination of unit assemblies. Great advance has been made in electric heating element design which considerably improves performance.

We have supplied almost every leading processor of basic plastic and rubber materials and have a wealth of general experience to help you in working out your special application. Write us today about your extrusion problems.

• *Write for copy of our general catalog that fully describes this 5-unit construction.*

NATIONAL ERIE CORPORATION

ERIE, PENNSYLVANIA • U. S. A.

EASE OF ASSEMBLY
LOW-COST PRODUCTION
PERMANENT FORM
COLORABILITY
TOUGHNESS
MOLDABILITY

ETHYL CELLULOSE
CELLULOSE ACETATE
NITROCELLULOSE

Cellulose Acetate transmits long life, low cost to intercom sets

Versatile cellulose acetate offers many product advantages to the designer of office equipment. Here, a design for a one-piece housing for an office intercommunication set simplifies molding and assembly; when in use provides easy access for adjustments and repairs. Acetate's rich color and lustrous, durable finish provide an attractive unit that will blend well with modern office furnishings.

When toughness and impact strength really count . . . when color and styling spell increased sales . . . consider cellulose acetate—the low-cost, quality plastic. Our technical staff stands ready to help with your design and material problems.

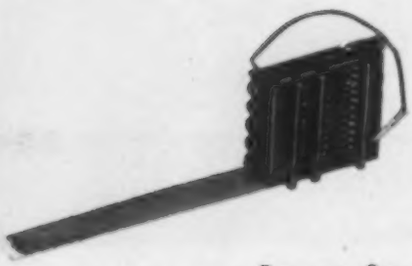


Suggested design for intercommunication set, with one-piece molded housing, by Carl Sundberg. Sundberg & Ferar, Detroit, Mich.

HERCULES POWDER COMPANY
INCORPORATED
916 Market Street, Wilmington 99, Del.

ARE YOU BUYING COMPRESSION MOLDINGS?





Prolon Plastics' custom molding service includes the facilities of one of America's most completely equipped compression molding plants. Up-to-date presses, electronic heaters, automatic cycle regulation—all these, plus constant scientific production control, help you get more for your money at Prolon Plastics.





For better quality, better service, write to

PROLON PLASTICS

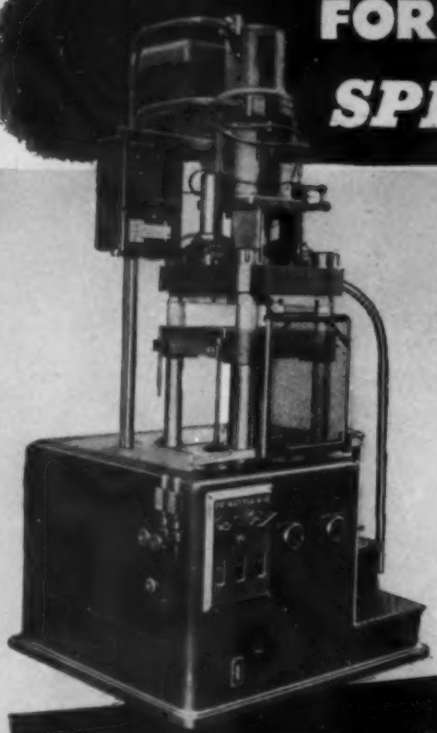
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Research • Design • Engineering • Die Making

COMPRESSION AND INJECTION

A Division of Pro-phy-lac-tic Brush Company, Florence, Mass.

FOR IMPROVED PRODUCTION
SPECIFY DE MATTIA



DE MATTIA INJECTION MOLDING PRESSES OFFER THESE IMPORTANT FEATURES—

- **Solid steel frames for maximum strength and rigidity**
- **Straight hydraulic clamp pressure of over 400 tons employing a standard 1000 PSI hydraulic system**
- **Hardened and ground platen guides with gibs to take up for wear without dismantling**
- **Push button control for forward and reverse motion of injection ram**
- **Controlled snubber action on both movements of closing platen helps protect mold faces and also adjusts speed of ejector movement**
- **Mold opening can be set to minimum required for fast molding cycles**
- **Controlled pressure and speed on injection ram**



HYDRAULIC VERTICAL PRESSES—Recommended for general molding production and highly efficient on metal insert work. Available in 4 ounce or 12 ounce capacity. Illustrated literature, including specifications, sent on request.

ALL HYDRAULIC HORIZONTAL PRESSES—These ruggedly built presses feature every advantage known to the industry. Models are available with 6, 12 or 24 ounce capacity. Write for complete engineering data and specifications. No obligation.

HANDLE SCRAP QUICKLY, EFFICIENTLY WITH HIGH CAPACITY GRANULATORS



For LARGE SLUGS AND CHUNKS. The DeMATTIA CHUNK CUTTER provides low cost salvage of molded pieces too tough for ordinary scrap grinders. Capacity over 150 lbs. per hour.

FOR GRANULATING of vinylite, Geon and all hard thermoplastics. Handles 200 lbs. per hour. Can be hand wiped in 3 minutes for color change.



Complete service on *MOLD MAKING*

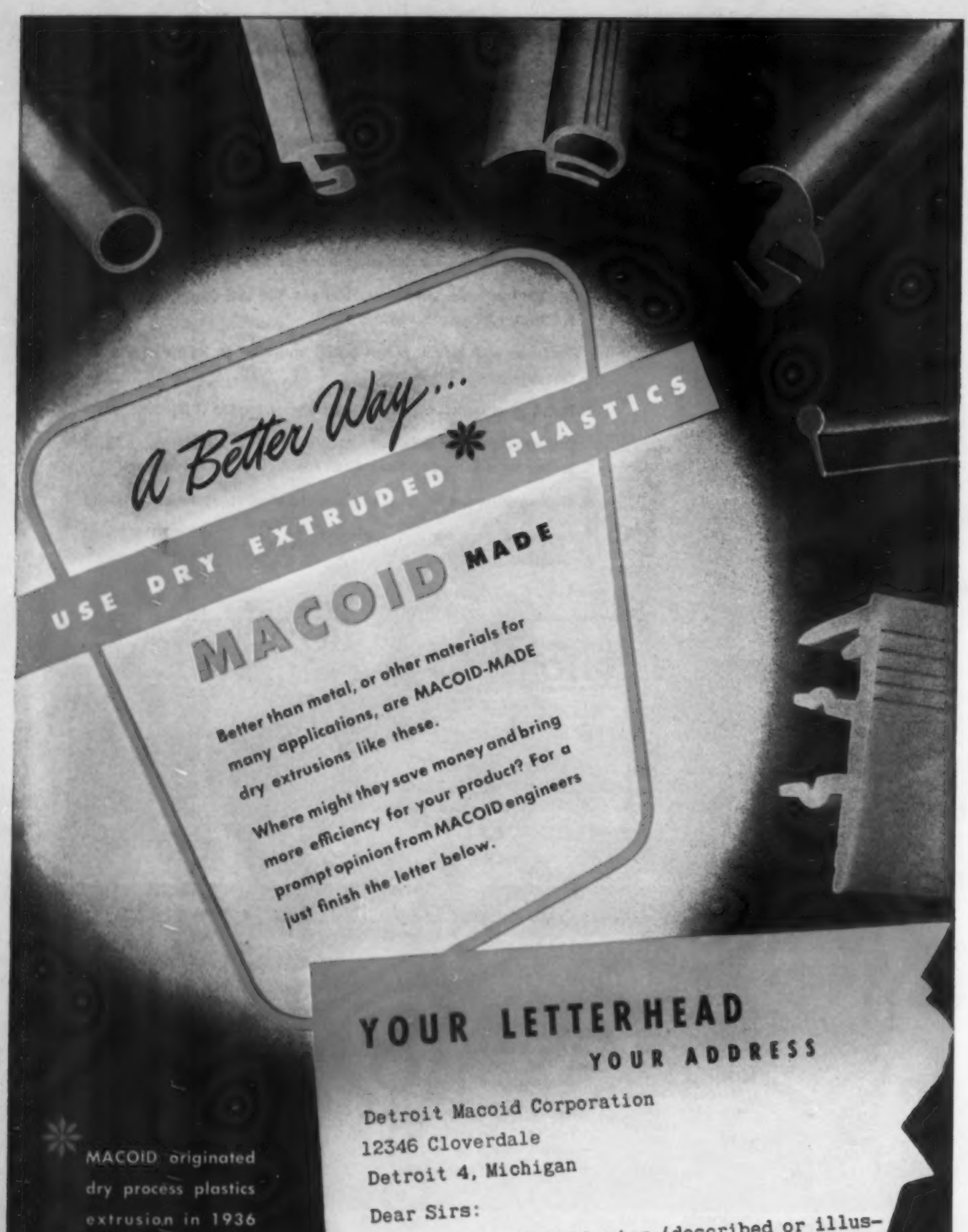
Our mold department is equipped to handle your mold requirements, large or small, from start to finish including design and engineering service. Inquiries on mold making will receive prompt, courteous attention.

DE MATTIA MACHINE and TOOL CO.

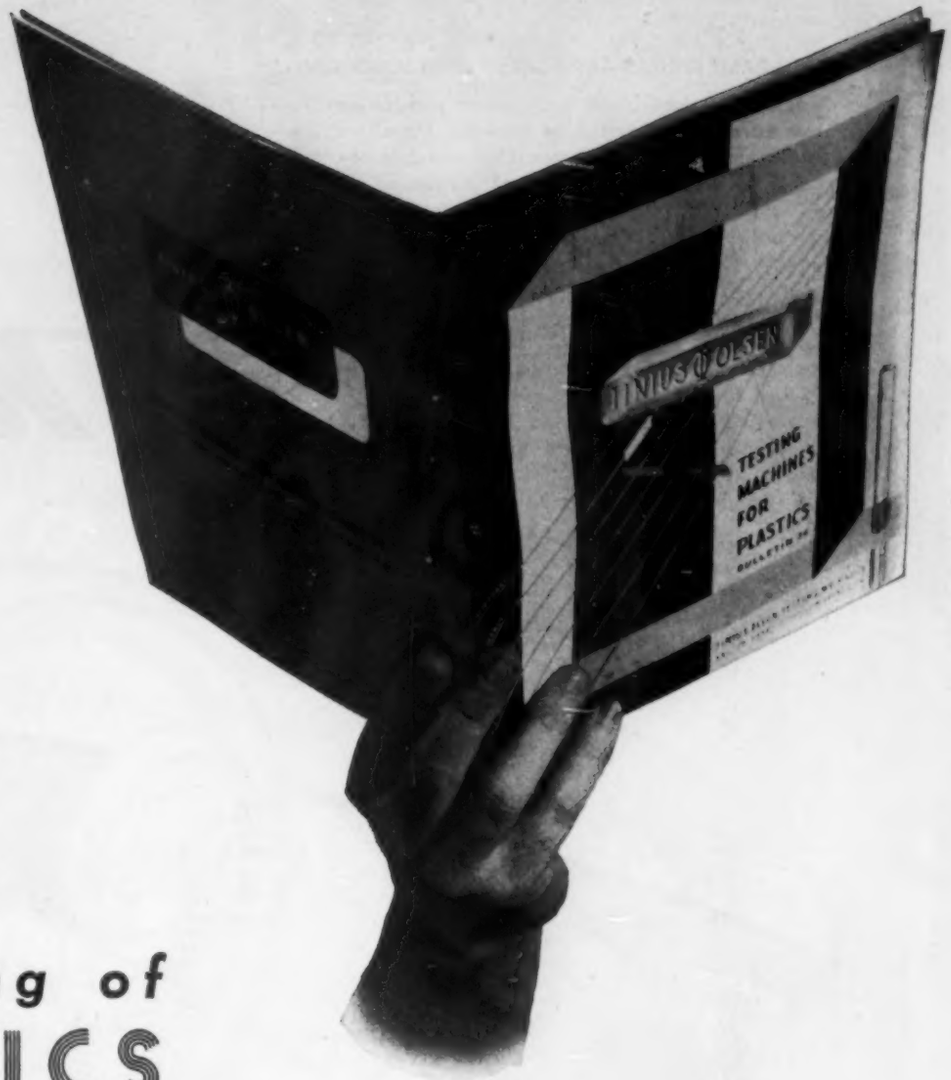
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SUPPLYING THE MOLDING INDUSTRY SINCE 1909


A Better Way...
USE DRY EXTRUDED PLASTICS
MACOID MADE
Better than metal, or other materials for many applications, are MACOID-MADE dry extrusions like these.
Where might they save money and bring more efficiency for your product? For a prompt opinion from MACOID engineers just finish the letter below.
YOUR LETTERHEAD
YOUR ADDRESS
Detroit Macoid Corporation
12346 Cloverdale
Detroit 4, Michigan
Dear Sirs:
Tell us how the following (described or illustrated herewith) can be made to our advantage by your dry plastics extrusion process.
MACOID originated dry process plastics extrusion in 1936 for the automotive industry.
ALSO INJECTION MOLDING

OLSEN BULLETIN #36



COVER TO COVER

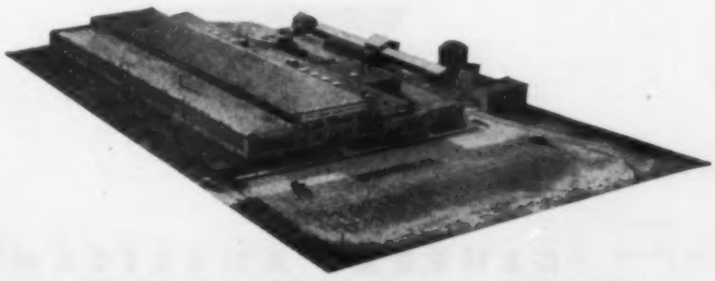
IT'S FULL OF INFORMATION ON

The Testing of PLASTICS

No it's not an easy job to compile a complete story on the physical testing of plastics but now that it is an accomplished fact we're glad to pass it on to you.

Olsen Bulletin #36 gives in detail the story of every type—and there are over twelve types—of Olsen testing equipment made especially for the testing of plastics. The story of the Plastiversal—Universal Testing Machine, the LO-CAP, the Torsion-Stiffness, the Impact, the Stiffness, the Flow Testers, the Heat Distortion Testers, and many more are included—from initial discussion to complete specifications of each machine. There's a section too on the exclusive Olsen Electronic Recorders and the specialized accessories and tools.

This up-to-the-minute Bulletin, which the plastics industry has been demanding, is just off the press—write today for your copy—it's the Olsen Bulletin #36.



We will be glad to show you our new plant on Easton Road, Willow Grove, Pa. (Suburb of Phila.). Over 100,000 square feet of area all on one floor devoted exclusively to the manufacture of testing and balancing equipment.

TINIUS OLSEN

Testing & Balancing Machines

TINIUS OLSEN
TESTING MACHINE CO.
2050 Easton Road, Willow Grove, Pa.

NASH DASH PANELS ARE COATED WITH LOGOQUANT*

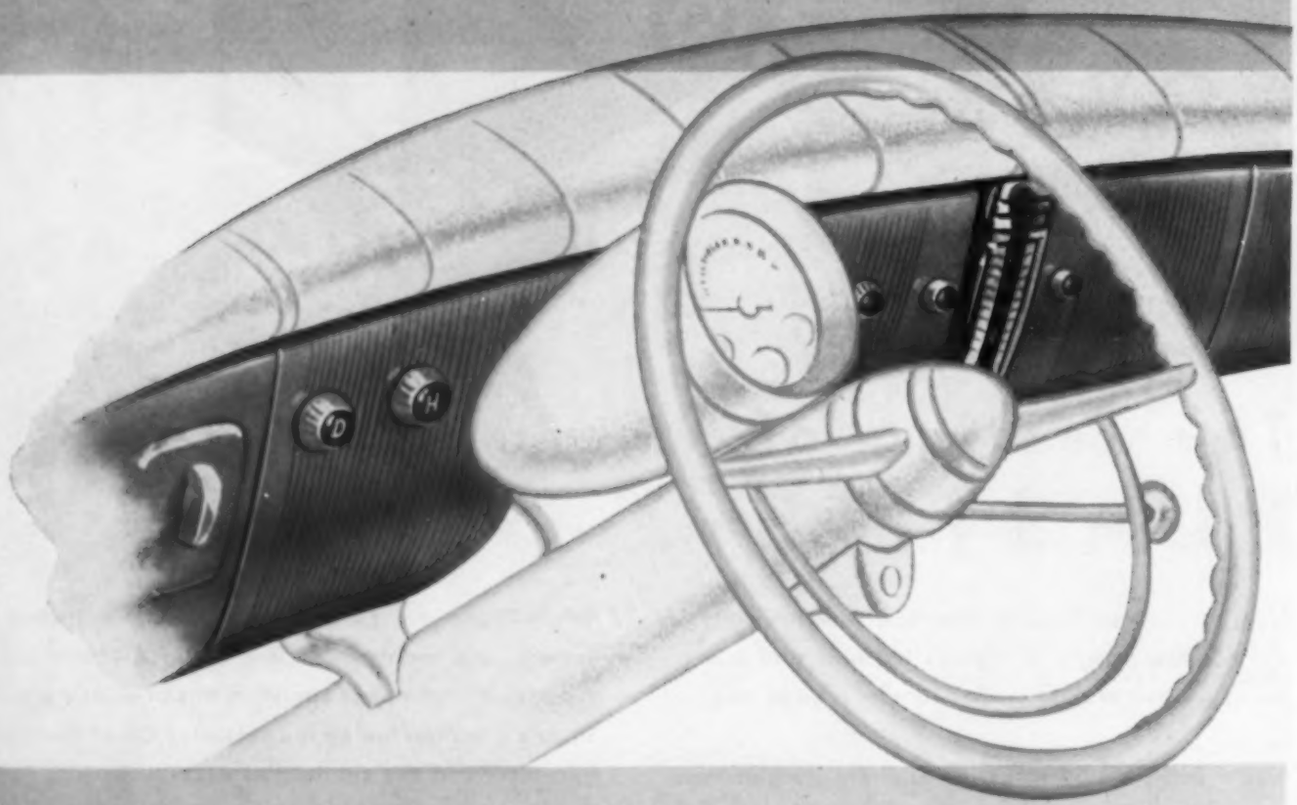
General American is the only major plastics manufacturer currently equipped to use—and actually using—lustrous, protective Logoquant. This new type of coating greatly increases the resistance of plastics to chemicals and abrasives. It gives a bright, glowing finish of unusually high clarity.

NO COLOR MATCHING PROBLEM!
NO NEED FOR CODING BATCHES!

The three parts of the Nash panel are always perfectly matched for color, whether they are molded from the same batch of material or not. The facilities of General American's large, completely equipped new paint shop are available to all customers who require true, perfectly-matched, long-lasting colors.

handsome!

Nash



ASK HOW GENERAL AMERICAN CAN SAVE YOU TIME AND MONEY ON PLASTIC PARTS

Ash trays
Cigar lighter caps
Clock-setting stems
Defroster control knobs
Gear shift levers and knobs
Hand brake handles
Heater control knobs
Hood control knobs
Horn buttons and rings
Instrument panels
Light switches
Radio panels and control knobs
Steering wheels
Window and door control knobs
Windshield wiper control knobs
AND MANY OTHER PRACTICAL PLASTIC PIECES

Plastics Division

PLASTICS DIVISION GENERAL AMERICAN TRADE MARK

GENERAL AMERICAN



rugged!

DASH PANEL



molded and painted by

General American

NEW—LARGE, COLOR-MATCHED POLYSTYRENE PANELS MADE POSSIBLE FOR INDUSTRY

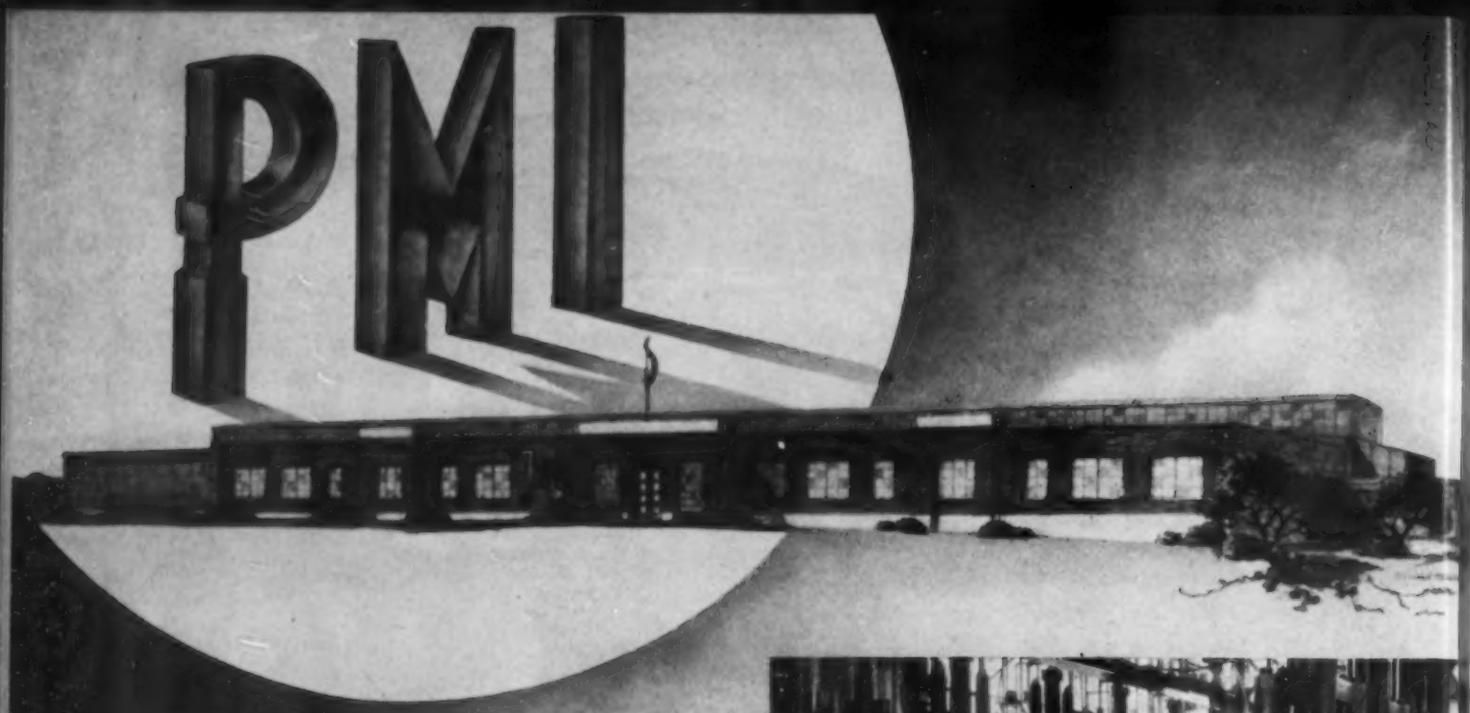
Nobody believed it could be done! "It's impossible," they said, "to get dimensional stability when molding a radio dial scale and other compound curvatures into single panels of polystyrene." But take a look at the ultra-violet resistant polystyrene dash panel of the handsome, new Nash. See its high-gloss three-dimensional effect beauty. It's the first successful large size polystyrene part for the automotive industry . . . molded by General American and coated with Logoquant.*

The same kind of creative thinking and research which produced this job is available to all General American customers. At General American you can use equipment such as 2 to 48 oz. injection presses and 100 to 2000 ton compression presses (with 71" x 74" platen areas). Complete finishing and assembling facilities are also at your disposal.

TECHNICAL DATA: Three molded parts—glove-box door, instrument panel and radio panel—are made on 16 oz. and 22 oz. injection presses. Eight molds produce the parts for both left-hand and right-hand drive cars. Tools are designed and built by General American.

TRANSPORTATION CORPORATION

135 South LaSalle Street, Chicago 90, Illinois • New York, 10 E. 49th St. • Los Angeles, Richfield Bldg.



The newly enlarged PMI plant is designed for close integration of plastics molding services. Modern streamlined arrangement of departments reduces waste . . . saves production time and expense. PMI research development, design engineering, molding and assembly services are all directed toward fulfilling your plastics requirements as efficiently and promptly as possible. Send for copy of bulletin describing PMI facilities.

PMI
REG. U.S. PAT. OFF.



Section of transfer molding department, showing a few high speed presses.



Partial view of injection molding department, which has a wide variety of press equ



Assembly and finishing departments.

General office view.



PLASTIC MANUFACTURERS

INCORPORATED

STAMFORD CONNECTICUT

INJECTION • TRANSFER & COMPRESSION MOLDING • COMPLETE ASSEMBLY

swing to

Pliobond

the adhesive that "bonds anything to anything"

IRON
COTTON DUCK
PLASTIC
SYNTHETIC RUBBER
GLASS
STAINLESS STEEL
ALUMINUM
CANVAS
COLD-ROLLED STEEL
HOT-ROLLED STRIP STEEL

All these materials — and practically any other solids — can adhere permanently to themselves or each other if you bond them with versatile **Pliobond.** It's a tan-colored, cold-setting, rubber-like thermoplastic liquid that dries rapidly to a waterproof chemically resistant bond with very high strength and permanent flexibility. Easily applied by brushing, spraying, spreading or roller coating —bonds hot (dry) by reactivation, or cold (wet). Sets quickly and can be dried even faster with use of elevated temperatures.

For full information, write: Goodyear, Chemical Division, Akron 16, Ohio.



USE PROVED *Products*

Pliobond—T.M. The Goodyear Tire & Rubber Company

GOODYEAR

We think you'll like "THE GREATEST STORY EVER TOLD" — Every Sunday — ABC Network

THERMALL ELECTRONIC HEATING EQUIPMENT

Announces NEW PLASTIC PREHEATER

MODEL "67"



PORTABLE

COMPACT (27" x 34" Floor Area)

HEATABILITY 6 to 7 Pounds in 1 Minute

Model "67" is a result of several years engineering and development in plastic preheating equipment. Designed to handle large or small loads of compound either as a general purpose preheater or on multi-cavity compression jobs where a loading board can be used to advantage. A new high in operating performance and efficiency is attained by this unit, the latest offering of THERMALL engineering.

"GUARANTEED PERFORMANCE — *or it doesn't cost you a cent"*

Check These Specifications of the THERMALL "67"

WIDTH ..... 34 inches
DEPTH ..... 27 inches
HEIGHT ..... 56 inches
WORK LEVEL ..... 32 inches
WEIGHT ..... 1000 pounds
CONSTRUCTION: Angle steel frame encased with heavy gauge sheet, equipped with heavy duty rubber wheel swivel casters. Finish: Durable gray wrinkle paint.
POWER REQUIRED: 220 volts, or 440 volts, 60 cycle, 3 phase, A.C. (Specify on your order.)

REGULATED FILAMENT VOLTAGE
POWER TUBES: 2 — #25X THERMALL.
RECTIFIER TUBES: 6 — #67 THERMALL.
HEATABILITY: 6 to 7 pounds per minute.
TIME CONTROL: Dual automatic electric resetting to select time interval — from 0 to 3 minutes, by seconds.
ELECTRODE AREA: 20" x 26".
MAX. COMPOUND CAPACITY: 15 to 20 pounds.
SAFETY: Dual safety interlock switches protect operator electrically and mechanically.

ARRANGE TO SEE THE "67" PERFORM

10 REASONS WHY THE THERMALL "67" CAN HELP INCREASE YOUR PROFITS

1. Cuts Your Molding Time 50% — or More.
2. Cuts Down Rejects and Mold Repairs.
3. Makes "Difficult" Compounds Easier to Handle.
4. Lets You Use Lower Press Operating Pressures.
5. Cuts Down the Number of Molds You Have to Build.
6. Operated by Anyone.
7. Low Tube Cost.
8. No Costly "Maintenance" Problem.
9. Adaptable to Hundreds of Jobs.
10. Low First Cost — Negligible Operating Cost and Long, Heavy Duty, Trouble Free Performance.

W. T. LA ROSE & ASSOCIATES, INC.
TROY, N. Y. **U. S. A.**



Packages that make sense—help make dollars!

Study the case of this "Step-Up Set" of International "1847 Rogers Bros." silverware for children. It is economically and rapidly molded from BAKELITE Styrene Plastics, which give it these outstanding features:—

Transparent, clear-view lid
Exquisite color
Good mechanical strength
Permanently tight-fitting base
Light weight
Dimensional stability
Washability
Resistance to water, most chemicals
Smooth, lustrous finish
Warm touch
Lasting usefulness

A remarkable list of features, indeed! No wonder so many manufacturers today choose BAKELITE Styrene Plastics for packaging. They're available in virtually any color, either transparent, translucent, or opaque. They are noted, too, for their ready moldability to complicated three-dimensional shapes and intricate details.

They may well be able to add beauty, economy, durability, and re-use value to displays and packages for your products. Ask Bakelite Corporation engineers for counsel in applying them to your specific requirements. Simply write Department 42.

Molder: F. J. Kirk Molding Company

Bakelite TRADE-MARK **Styrene** PLASTICS

BAKELITE CORPORATION

BAKELITE CORPORATION, *Unit of Union Carbide and Carbon Corporation* UCC 30 East 42nd Street, New York 17, N. Y.

NRM *PIONEERS IN PLASTICS PROCESSING MACHINERY*



IN 1939 NRM built the first Extruder designed especially for the extrusion of thermo-plastic materials.

IN 1949 NRM Plastics Extruders are the most widely used in the industry. The reason—no other Extruder has all these cost-cutting features!

10 YEARS . . . . *devoted exclusively to the development of plastics extrusion equipment—put this experience to work for you!*

NRM features that make Extrusion the Process for Profit!

1. **CREATIVE ENGINEERING.** Complete division with laboratory facilities devoted exclusively to design, development and improvement of plastics equipment.
2. **HEAVY-DUTY CONSTRUCTION.** Engineered for long life, trouble-free operation.
3. **QUANTITY AND QUALITY OF PRODUCTION.** Large output of close tolerance extrusions.
4. **FLEXIBILITY.** All extruders can be readily adapted for wire covering, sheet extrusions, tubular shapes, and an infinite variety of profiles.
5. **TORPEDO SCREWS.** Patented *exclusive* NRM design for far better extrusions of most *rigid* materials.
6. **FULL FLIGHTED SCREWS.** For elastomeric materials—Proven designs with thousands of hours of satisfactory performance.
7. **FEED SCREWS.** Made from special, high grade heat treated forged alloy steel, chrome plated, with surface hardened flights. Long drive shank extension holds screw in perfect alignment in cylinder, prolonging life of screw and cylinder liner. Hollow bored for fluid heating or cooling. Easily removable through front of extruder.
8. **CYLINDERS, OIL HEATED—STEAM HEATED—ELECTRICALLY HEATED.** Cylinders are designed with a series of individual zones for heating and cooling.
9. **FEED OPENINGS.** Properly designed for either granular, powder or strip feed.
10. **AIR GAP.** Space between hopper end of cylinder and gear housing to minimize transfer of heat from cylinder, and permit ease of inspection and maintenance of thrust bearing oil seal.
11. **SWING TYPE DIE ADAPTER GATE.** Hinged for quick changing of screens and dies, to include electric heater, temperature control and thermometer. Quick opening.
12. **DRIVE GEAR UNITS.** Heat treated, cut steel herringbone gears throughout. All shafts mounted in heavy-duty roller bearings. All gear housing joints oil tight, self-lubricating system, eliminating force feeding.

NRM

NATIONAL RUBBER MACHINERY CO.
General Offices: AKRON 8, OHIO

Plastics MACHINERY DIVISION

EXPORT DISTRIBUTORS: OMNI PRODUCTS CORPORATION, 460 FOURTH AVE., NEW YORK 16, N. Y.

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DESIGN for better living!

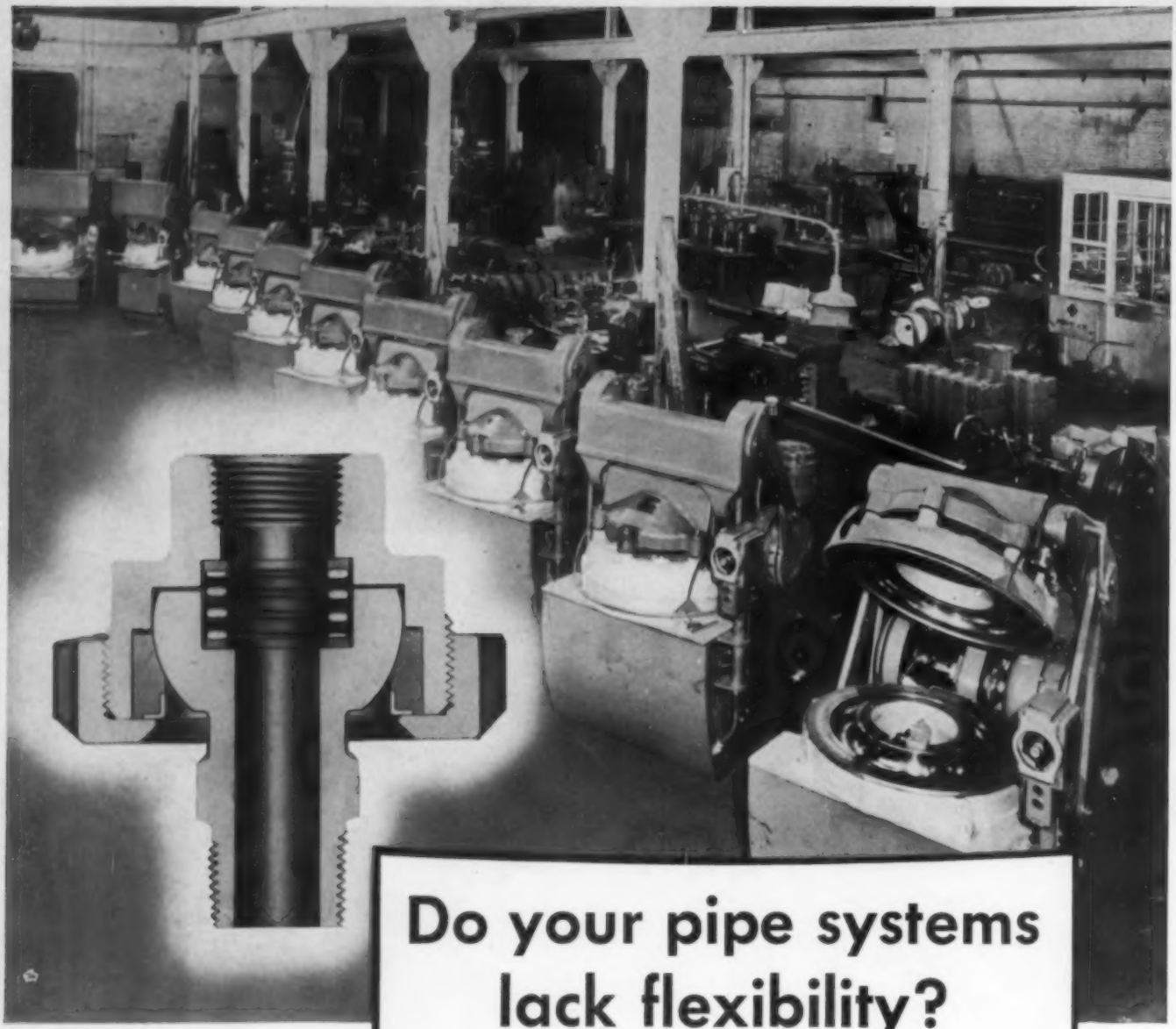
• New beauty, convenience, economy has been made possible through the use of plastics and metal and plastic combinations. The modern automobile has demonstrated this great potential. And the broad scope of the varied applications is being repeated again and again throughout industry.

Here under one roof at Auto-Lite's great Bay Manufacturing Division in Bay City are the technical skills and production capacity for a new art rendered in plastics. The artistic skill of Auto-Lite's Art and Style Division is available on matters of design and development.

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Bay Manufacturing Division
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Auto-Lite
plastics and metals

AUTO-LITE MEANS PRECISION MANUFACTURING



Do your pipe systems lack flexibility?

Here's an example of how

BARCO CAN PROVIDE IT

Every tire press in this assembly line is equipped with Barco Swivel Joints which provide the piping flexibility required to open and close the press.

For over 30 years Barco Joints have been serving industry and transportation—each year becoming more and more popular. Today, they are used in almost every kind of job requiring *flexible* fluid-conveying systems. By absorbing strain and stress, by compensating for expansion and contraction, Barco Joints have long been practically indispensable. Write for full information to Barco Manufacturing Company, 1809 Winnemac Avenue, Chicago 40, Illinois. In Canada: The Holden Co., Ltd., Montreal, Canada.

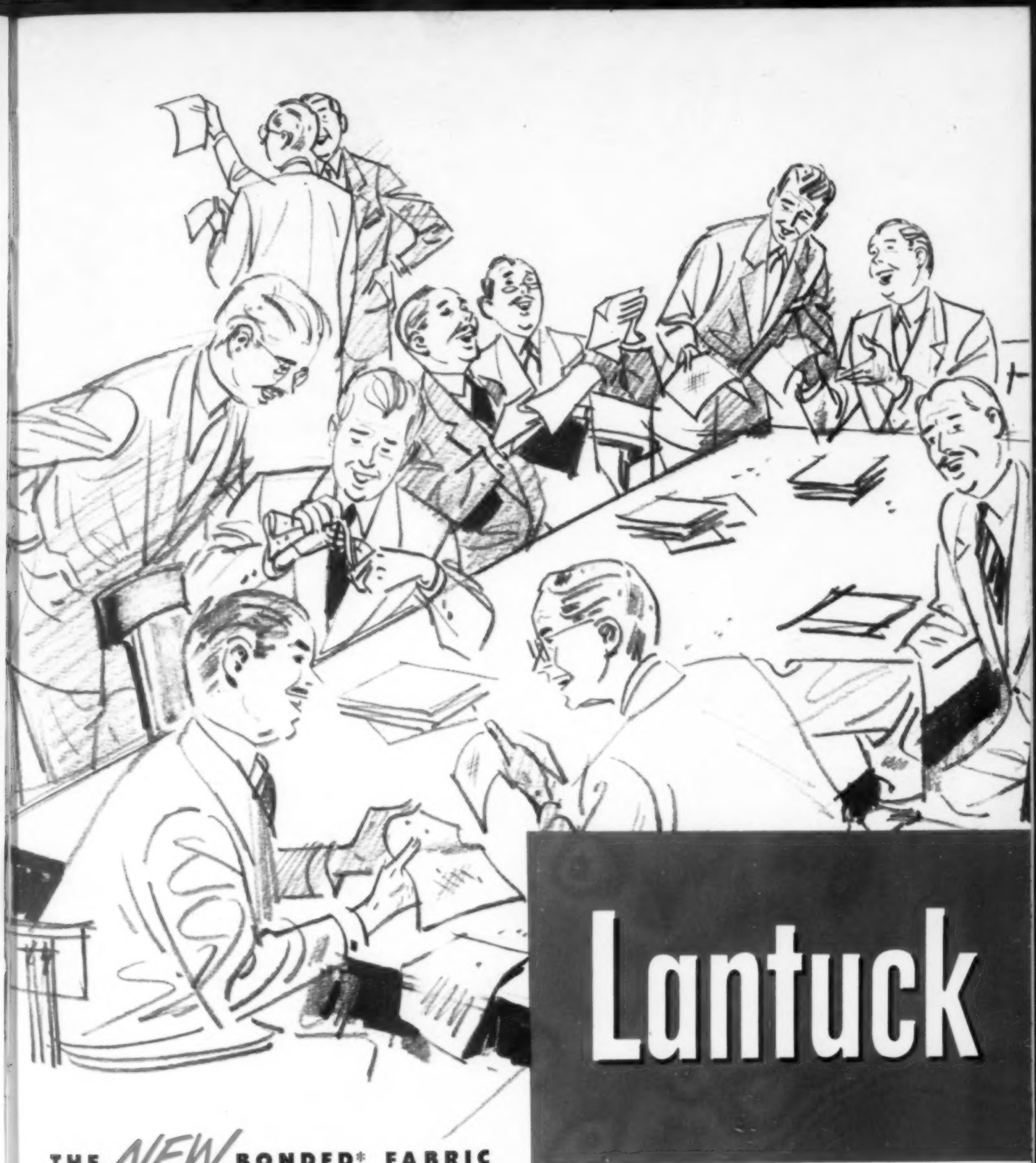
BARCO FLEXIBLE JOINTS

FREE ENTERPRISE—THE CORNERSTONE OF AMERICAN PROSPERITY



Not just a swivel joint ...but a combination of a swivel and ball joint with rotary motion and responsive movement through every angle.

"MOVE IN EVERY DIRECTION"



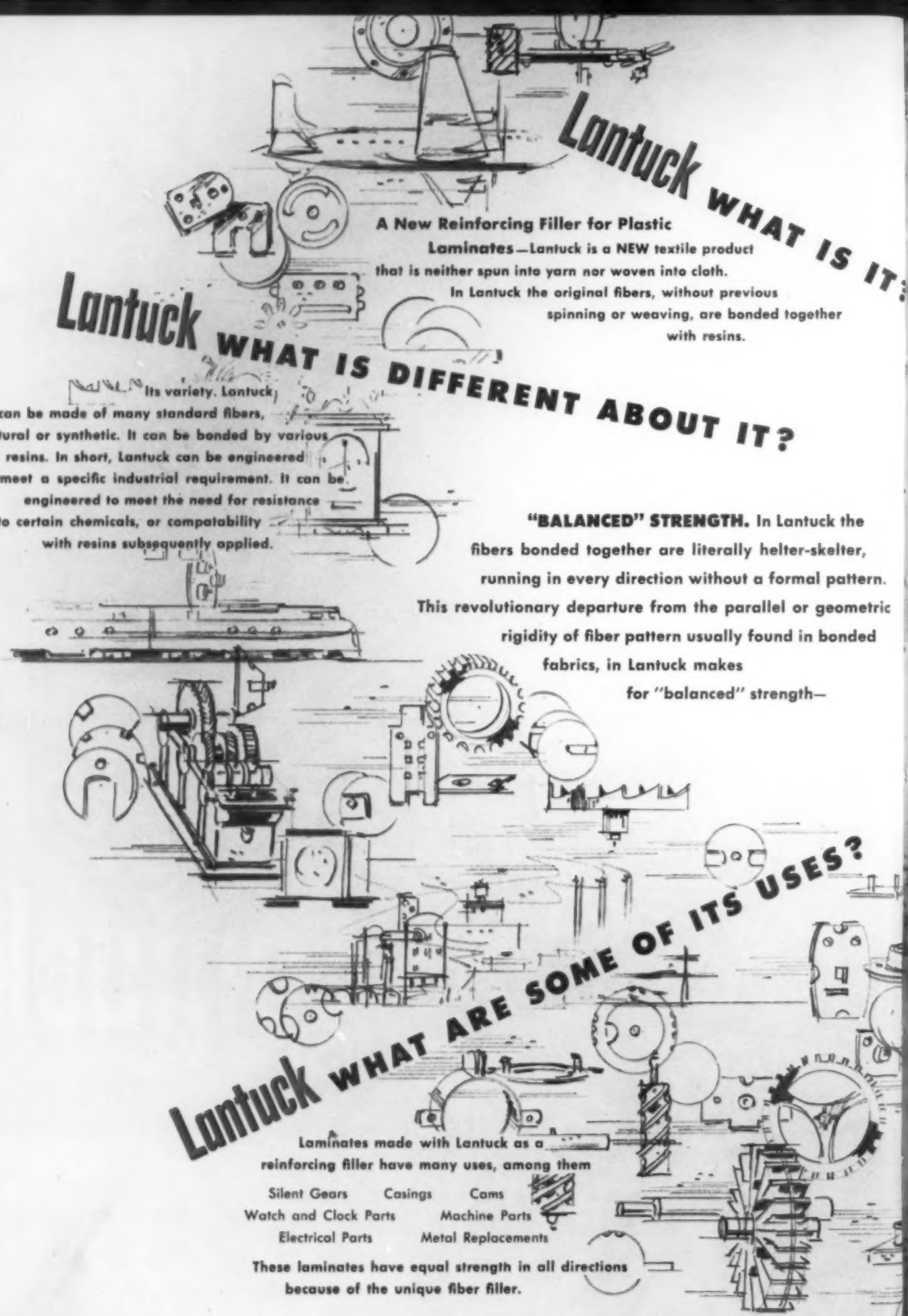
Lantuck

THE *NEW* BONDED* FABRIC

*(not spun — not woven)

WITH BALANCED STRENGTH...

LANTUCK IS MADE BY WEST POINT MANUFACTURING COMPANY. WELLINGTON SEARS COMPANY, SELLING AGENTS



Lantuck WHAT IS IT?

A New Reinforcing Filler for Plastic Laminates—Lantuck is a NEW textile product that is neither spun into yarn nor woven into cloth. In Lantuck the original fibers, without previous spinning or weaving, are bonded together with resins.

Lantuck WHAT IS DIFFERENT ABOUT IT?

Its variety. Lantuck can be made of many standard fibers, natural or synthetic. It can be bonded by various resins. In short, Lantuck can be engineered to meet a specific industrial requirement. It can be engineered to meet the need for resistance to certain chemicals, or compatability with resins subsequently applied.

"BALANCED" STRENGTH. In Lantuck the fibers bonded together are literally helter-skelter, running in every direction without a formal pattern. This revolutionary departure from the parallel or geometric rigidity of fiber pattern usually found in bonded fabrics, in Lantuck makes for "balanced" strength—

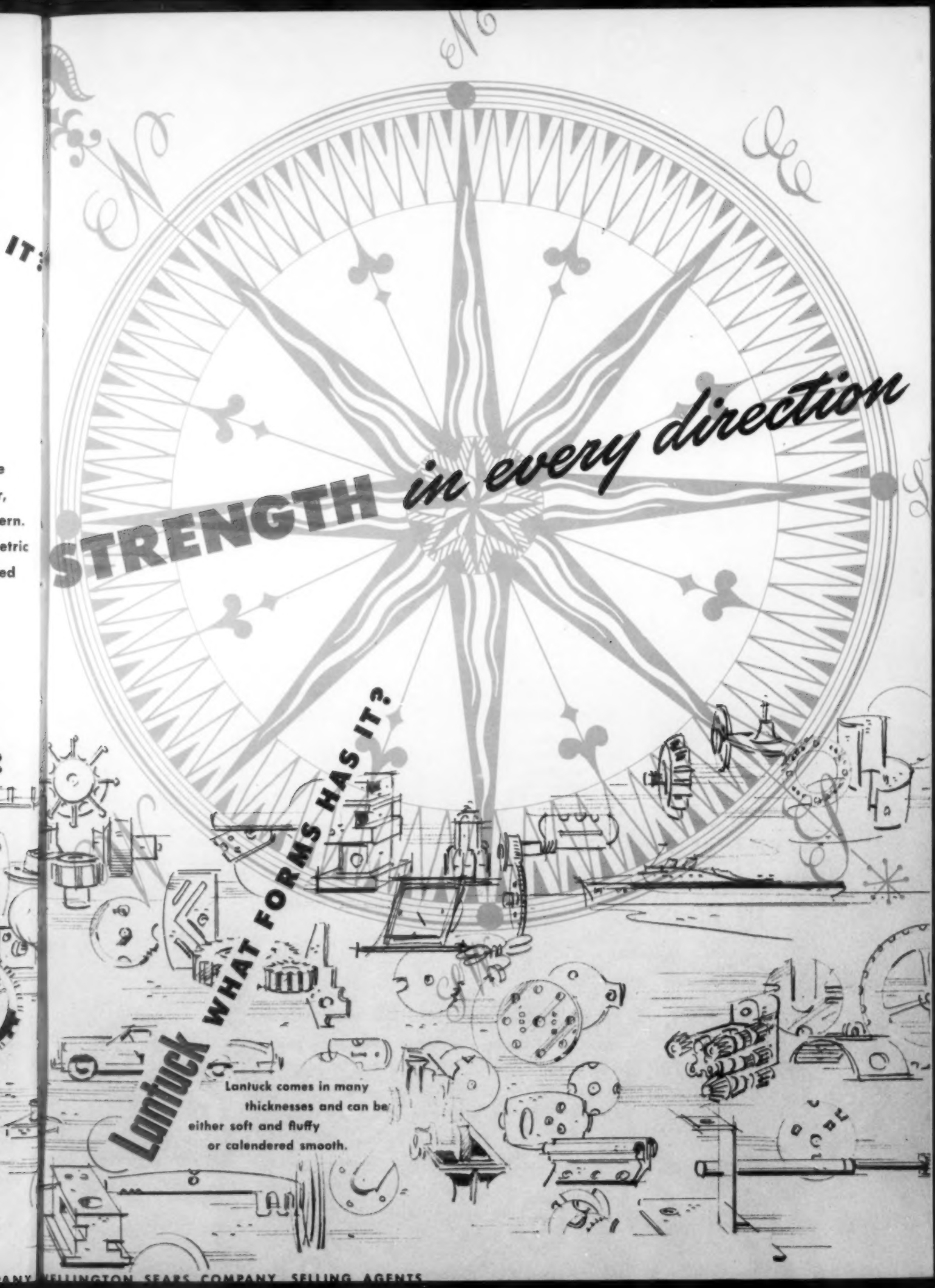
Lantuck WHAT ARE SOME OF ITS USES?

Laminates made with Lantuck as a reinforcing filler have many uses, among them

Silent Gears Casings Cams
Watch and Clock Parts Machine Parts
Electrical Parts Metal Replacements

These laminates have equal strength in all directions because of the unique fiber filler.

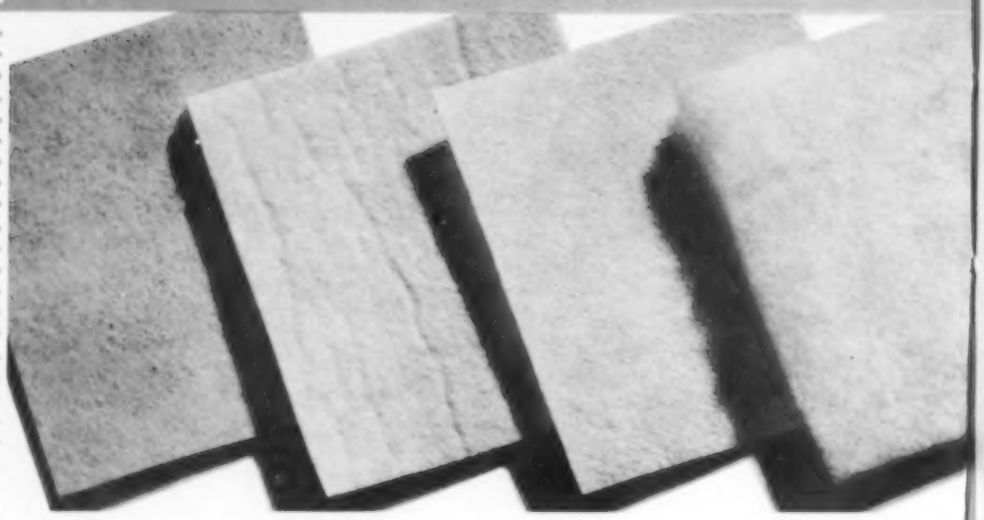
LANTUCK IS MADE BY WEST POINT MANUFACTURING COMPANY



ELLINGTON SEARS COMPANY SELLING AGENTS

Lantuck presents so many variations in fiber, bonding agent and finish, it can be *engineered* to meet the needs of a particular problem.

Lantuck has many forms



Thin, smooth-calendered Lantuck of acetate rayon, bonded with a mildew-resistant resin is a good example of this new material's versatility.

Lantuck made of clean cotton fibers, bonded and calendered, is a reinforcing filler that will be of interest for use in high-pressure laminates.

This white-looking, glossy calendered Lantuck of bonded viscose rayon fibers is well adapted to low-pressure laminating with polyester resins.

Bonding agent i this fleecy type of Lantu is compatable with resi ordinarily used in low-pre sure laminating. Of inte est where bulk is desired

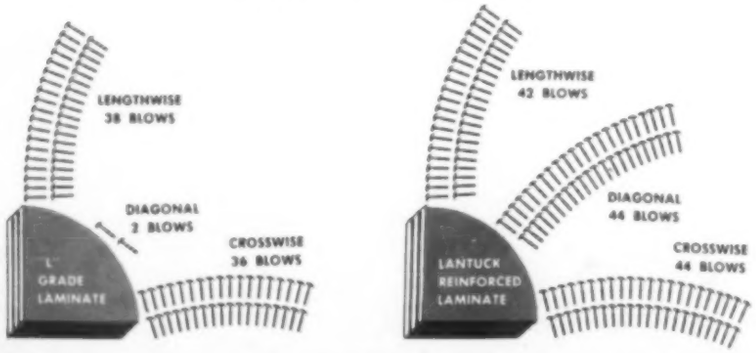
These are but 4 of Lantuck's many forms.

"Balanced" strength proved by tests

One of many tests to which Lantuck-reinforced laminates have been subjected is the Empirical Repeated Impact Test, conducted by dropping a weight on the edge of a sample held in a vise. Samples of "L" grade laminate and Lantuck-reinforced laminate were tested from different directions to determine the number of blows required to break each sample with results as shown below:

Direction of Samples	"L" Grade Laminate	Lantuck-reinforced Laminate
LENGTHWISE	38 BLOWS	42 BLOWS
CROSSWISE	36 BLOWS	44 BLOWS
DIAGONAL	2 BLOWS	44 BLOWS

RESISTANCE TO IMPACT

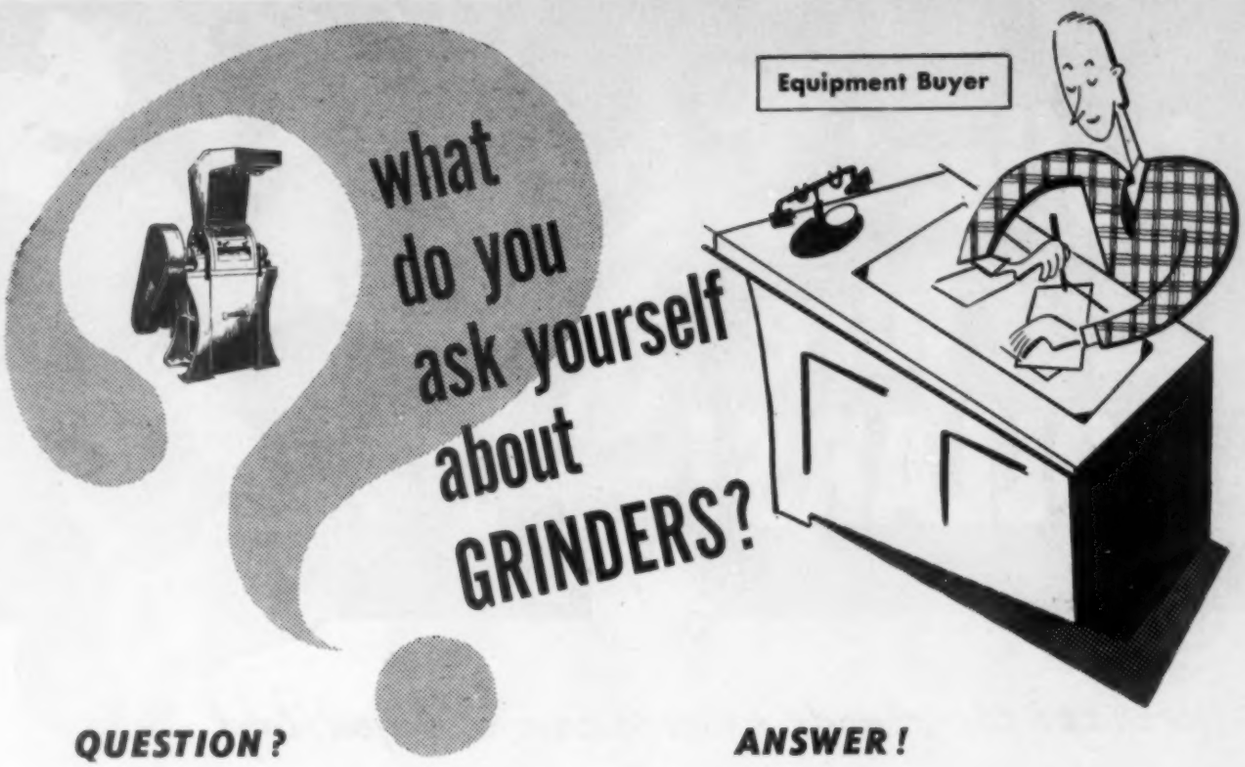


Lantuck has "balanced" strength — strength in every direction.

For further information on Lantuck, or sources of laminates made with Lantuck, call or wri Wellington Sears Company, 65 Worth Street, New York 13, New York.

Lantuck is made by WEST POINT MANUFACTURING COMPANY
WELLINGTON SEARS COMPANY ***selling agents***
65 Worth Street, New York 13, New York

Boston • Chicago • Detroit • Atlanta • Philadelphia • Los Angeles • San Francisco • New Orleans • St. Lo



QUESTION ?	ANSWER !
4. What provision is made in the hopper to keep particles or pieces from flying back when feeding the machine?	**4.** Ball & Jewell has an improved standard hopper equipped with permanent magnet, to meet almost every condition, but can also furnish special hoppers with slides or baffles to meet unusual job specifications.
5. How thick and heavy a piece can be fed to the granulator cutting chamber without damaging the machine?	**5.** There is a Ball & Jewell grinder capable of handling any size or type material, regardless of weight, except stone and metal. Knives are of solid steel and set at proper angle to assure cleaner cutting action with minimum power and wear.
6. How much floor space does the grinder require?	**6.** Ball & Jewell machines are designed to take minimum floor space—and still meet the individual job specifications. Overall dimensions of all sized machines are shown in catalog.

ASK YOUR NEAREST REPRESENTATIVE

CHICAGO: Neff, Kohlbusch & Bissell Inc. DETROIT: J. C. Austerberry's Sons. LOS ANGELES AND SAN FRANCISCO: Machinery Sales Co. NEW ENGLAND: Standard Tool Co., Leominster, Mass. ATLANTA, GA.: George L. Berry. ST. LOUIS: Larrimore Sales Co. CLEVELAND 22, OHIO: L. F. Willmott, 3701 Latimore Rd. SEATTLE 4, WASHINGTON: Olympic Supply Co. KANSAS CITY, KANS.: Fluid Air Engineering Co. MINNEAPOLIS, MINN.: Winston Henning Co., Chas. W. Stone Co. CINCINNATI, OHIO: Index Machinery Corp. DALLAS, TEXAS: Perry Machinery Corp. CANADA: Williams & Wilson, Ltd., Toronto & Montreal. FRANCE: Importexo, 20 Rue Cambon, Paris 1, France. Foreign Distributors: Omni Products Corp., 460 4th Ave., NEW YORK 16, N. Y.



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Please send me your informative book on grinders.

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Dolls courtesy of Ideal Novelty & Toy Co., New York

...perhaps the Anode process can help you, too!

THESE dolls are a sell-out everywhere because of the life-like appearance and "latex skin" that feels almost like nature itself—thanks to the Anode process!

This patented process is used to produce such diversity as surgical gloves, sinus masks, dish drains and even duck decoys. These are only a few of the articles made by this remarkable process... hundreds are possible. Perhaps you have an idea or product that can be made profitable by the Anode process.

what the Anode Process is

It's a patented method whereby latices and mixes are deposited and converted to solid materials—on a wide variety of forms. The process is available to prospective manufacturers under a simple and generous licensing arrangement.

American Anode offers complete service

American Anode is fully equipped to do a complete job for you in our own factory. We have the latices and mixes. We have the equipment and the trained personnel. If you prefer, our engineers can set up the Anode process in your plant, supply the materials and technical advice—even machinery.

If your products are in the textile, paper, toy manufacturing, or electro-plating fields—check with American Anode. American Anode Mixes can be compounded in a rainbow of colors. They can be sprayed, spread, saturated, dipped or brushed and they can be compounded to meet a wide variety of service conditions.

We may be able to help you improve your products or produce new ones at lower cost. For complete information write to Dr. R. V. Yohe, President, American Anode Inc., Dept. AD-2, 60 Cherry Street, Akron, Ohio.

A new Plastisol... AMERAN resin paste

Can be used to make coatings or flexible sheets which maintain permanent lustre. No solvents; no fire hazard; no recovery problem. Can be made oil-resistant, acid-resistant, chip-proof. Full variety of colors, including white.

Ideal for coating metal and wire, wire baskets, plating racks, pipe linings, wood, textiles and paper . . . for making dipped gloves, toys and dolls, film applications . . . for casting or molding.

AMERICAN ANODE

CRUDE AND AMERICAN RUBBER LATICES, WATER CEMENTS AND SUSPENSIONS

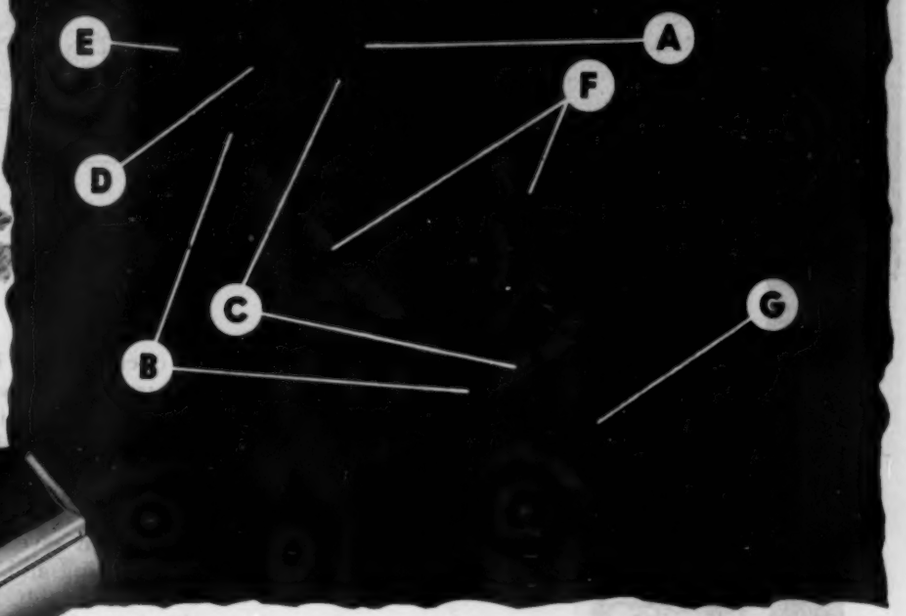
New Razor has a Keen Edge on Competition

The trim, *waterproof* housing, for this new electric wet shaver, the Collins VIBRAZOR, is economically molded and assembled by Aico, for the New Electric Razor Corporation, Baltimore. The manufacturer knew his product would invade a highly competitive field . . . that it would need *every* advantage to insure its success. By expert mold design and material selection, —skillful molding and assembling, —Aico has provided good looks, and durability at *low cost.*

New products are quickly accepted in discriminating markets when Aico experts help plan and produce them. 32 years of molding all plastics by all methods has earned us experience by which *you* can *profit.*

HANDSOME PLASTIC HOUSING DESIGNED FOR *Fast Assembly . . . Speedy Sales*





Selection of ethyl cellulose for this handle was based on its great strength, light weight and electric insulating properties. A mirror-smooth four cavity mold produces up to 3600 pieces a day, shiny and ready for immediate assembly after the gates are removed. Note that the design has been simplified so that all pieces are the same, the projections (A) of one half fitting into holes (B) of another when any two pieces are in perfect register. This speeds accurate assembly. The razor's mechanism is securely supported by shoulders (C) at each end of the larger cavity. Smaller cavity (D) provides space for slack wire. Connecting pins are mounted on a plastic piece held securely in channel (E). Halves are joined together by cementing at surfaces (F) thus insuring a sealed, water-tight and shockproof housing for the driving element. *Magnetic force is exerted* THROUGH *the plastic case itself.* When assembled, the flange extensions (G) make an ideal holder for quick, simple detachment of the razor head.

Strength of the housing has been demonstrated in tests in which the unit has withstood a drop of 10 feet to 15 feet without breakage.

AICO
PRECISION MOLDING
for over 32 years

28 actual applications of Aico molded plastics are shown and fully described in this Portfolio. Send for your copy today and see how plastics can improve the competitive position of *your* products.

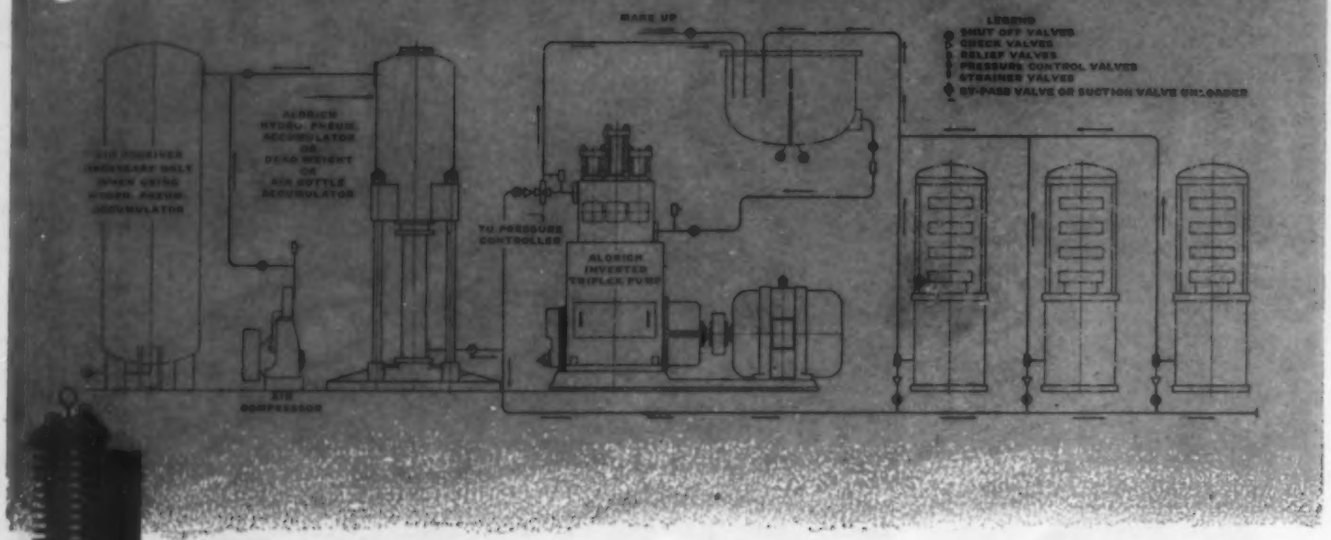
AMERICAN INSULATOR CORPORATION
New Freedom, Pennsylvania

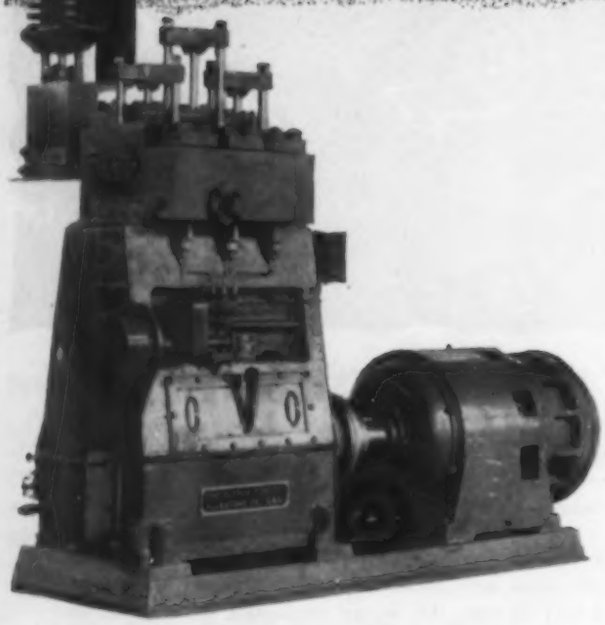


MANY THINGS ARE BETTER BECAUSE OF PLASTICS

Centralize and Save

. . . with the ALDRICH Central Hydraulic System





The Aldrich Inverted Triplex Pump

For operation of hydraulic presses—a single, concentrated source of hydraulic power is good engineering economics. Just as a central power station most efficiently and economically serves an entire community—so can the Aldrich Central Hydraulic System serve your presses.

Centralization saves. Present Aldrich installations in plastic molding and record pressing plants prove this. You save through less waste energy, more efficient production of power, quick accessibility, minimum machinery, less maintenance and repair, less time wasted.

The heart of the Aldrich System is the Aldrich Pump. Either the Aldrich Inverted Triplex or the Aldrich-Groff "POWR-SAVR" Controllable Capacity Pump can be used. The Aldrich Inverted Triplex, a constant stroke, constant speed pump, ranges in power from 10 to 300 HP and may be coupled directly or through speed-reducers to a driver located on the floor—saving space and foundation costs. The "POWR-SAVR", a variable stroke pump, provides stepless, automatic control of delivery. And delivery is in almost direct proportion to demand—saving power.

Whatever your job may be, if you use several presses—check with our engineers on the Aldrich Central Hydraulic System.

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The **FIRST** *Name in Reciprocating Pumps*



The New NORGE HYDROVOIR Custom Molded by ERIE RESISTOR

This Hydrovoir vegetable compartment for the '49 Norge Refrigerator has excellent resistance to moisture absorption. It is stronger and lighter in weight than glass. The Hydrovoir is molded accurate to dimensions, free from warpage, free from flaws, on our new 28 ounce molding machine.

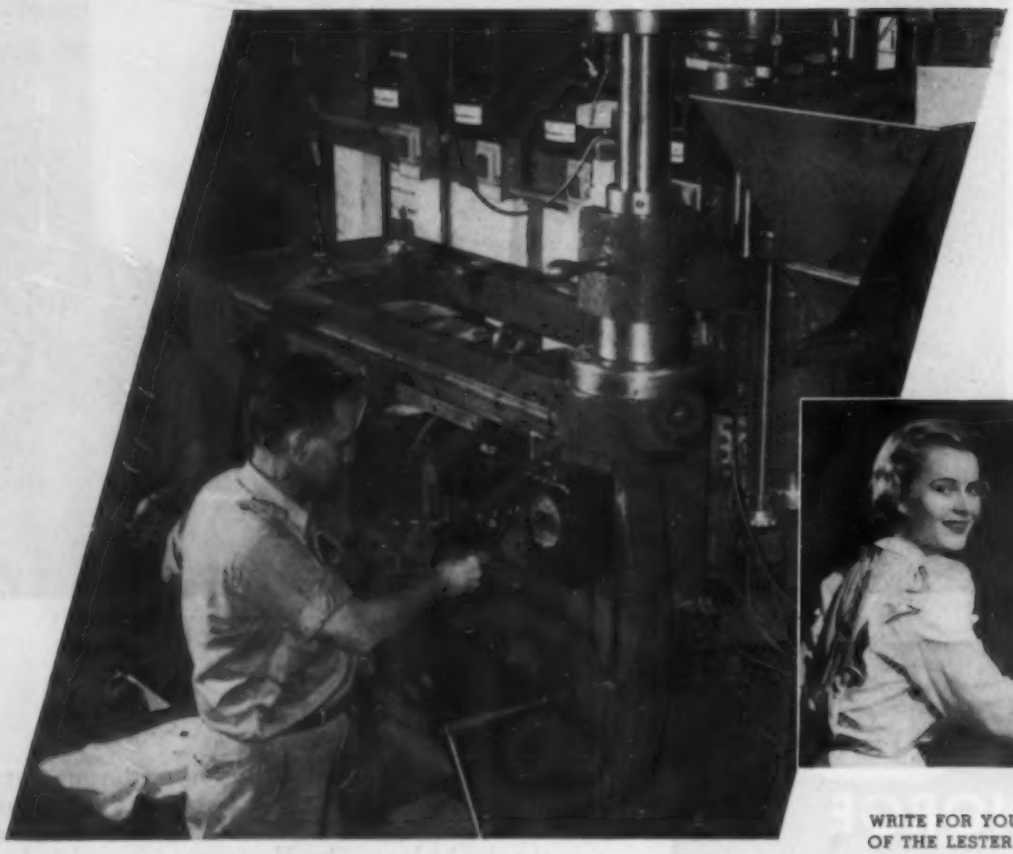
Erie Resistor, pioneer in the field of custom injection molding, has the experience and facilities for meeting unusual molding problems. We have built an enviable reputation for the successful production of designs declared impossible by others. Erie also has molded pieces economically whose cost had been found prohibitive until we devised practical means of short-cutting expensive methods. It pays to consult Erie Resistor on your injection molding problems. Write for new bulletin describing Erie Resistor's facilities.

Plastics Division

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L IS FOR LESS LOST TIME





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OF THE LESTER PRESS

Here are the facts again to back up our claims on Lester performance. We simply quote from a letter to us from Roylett Manufacturing Company in Memphis, Tenn.

"We wish to say that we are very happy with the performance of our eight ounce Lester. It is a rugged, dependable machine. Changing molds or colors require the least loss in time and materials. Our maintenance factor is very low.

"We are running a very interesting custom job for THE SUNMASTER CO., INC., 921 Rayner, Memphis, Tenn. We are currently molding seven plastic parts in two combination molds with a great number of retractable cores. We wish to report very good production on this job due to the low percentage of rejects and quick mold and color changes."

LESTER INJECTION MOLDING MACHINES

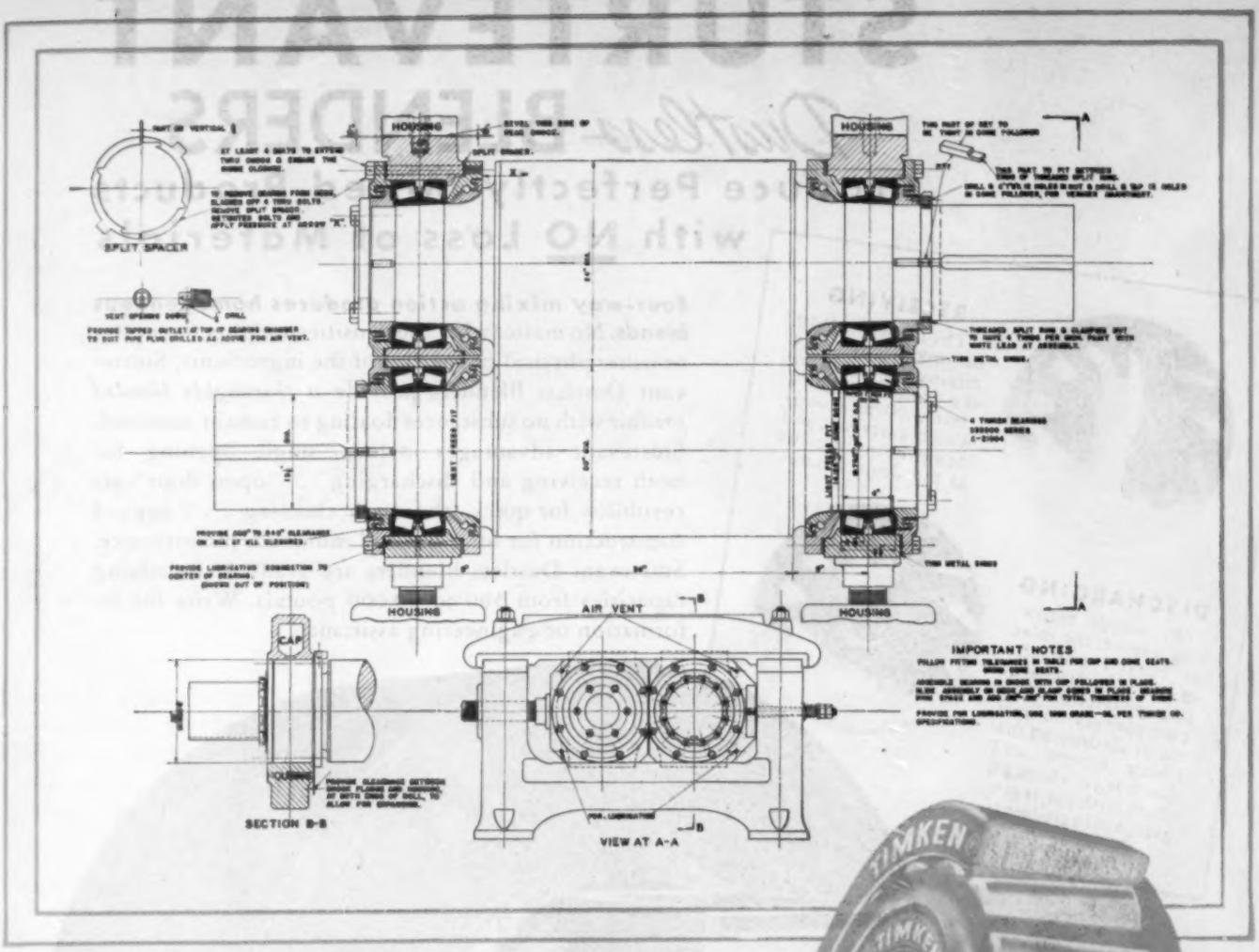
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Your Refiners Will Do A Better Job At Lower Cost



ON TIMKEN® BEARINGS

Plastics refiners, like compounding mills, operate smoother with less attention and lower power demands when the rolls are mounted on Timken Tapered Roller Bearings as shown in the typical arrangement here.

Friction is reduced to the point of elimination. Lubrication is simplified and economized. Radial, thrust and combination loads are carried on the tapered rolls and races with a wide margin of safety. Mill rolls are held rigidly in alignment under all conditions of operation. Roll life is lengthened because there is no wear on the roll necks.

Timken Bearing Equipped mills and refiners daily are proving their superiority, with substantial savings of time and money. The sooner you install them in your plant the more you will save. Our engineers will be glad to consult with you at any convenient time. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address, "Timrosco".

TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

NOT JUST A BALL ◯ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ◯ AND THRUST —◯— LOADS OR ANY COMBINATION

STURTEVANT

Dustless BLENDERS

Produce Perfectly Mixed Products with NO Loss of Materials



RECEIVING

The ingredients to be mixed enter the mixing chamber of the drum through a chute. Note scoops which carry up and dump the ingredients as the drum rotates.



DISCHARGING

By simply throwing a lever, the inlet is closed and the mixer is in discharging position. The completely mixed materials drop off the lifting scoops and discharge through chute without segregation of ingredients.

Four-way mixing action produces homogeneous blends. No matter what the densities, weights, finenesses or other physical properties of the ingredients, Sturtevant Dustless Blenders provide *a thoroughly blended product* with no substances floating to remain unmixed. Sturtevant advantages include—single opening for both receiving and discharging . . . "open door" accessibility for quick, thorough cleaning . . . rugged construction for long life and minimum maintenance. Sturtevant Dustless Blenders are available in mixing capacities from 500 to 20,000 pounds. Write for information or engineering assistance.



STURTEVANT MILL COMPANY
110 CLAYTON STREET, BOSTON 22, MASS.

Designers and Manufacturers of

CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS
MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS



Now you put HUMPTY together again!

Unlike the thin shelled Humpty-Dumpty of Mother Goose fame, this plastic Humpty is a very tough egg indeed. He has to be. He'll have many a "great fall" at the hands of his young owners who are actively learning what the nursery rhyme means.

Molding Humpty called for the use of plastic materials that could take some pretty hard knocks. Since the youngsters will quickly "put Humpty together again," his parts had to be molded with precision fine tolerance.

Whether your plastic problems are tough nuts—or tough eggs to crack—let us take a crack at them. Ours is America's most modern injection molding and extrusion plant. We are geared to create better, more salesworthy plastic products for you. A visit to our plant or a call from one of our representatives will profitably point this out to you.

*Write on your letterhead for the new Injection Molded and Extruded Plastics Catalog. Or, for detailed information about MILLS-PLASTIC *, piping, tubing and fittings, write for circulars containing data and illustrations.* **Trademark Registered*

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wiped-on paint permanently.

Ordinarily such specifications would prevent
a straight draw from the mould because of undercuts
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but inflating moulding costs as well.

But this isn't an ordinary job. The ordinary
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of what it might, and permits an economical
moulding schedule. The trick's in the hand engraving
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angles to the casting surface, the hob was actually
engraved at *right angles to the base of the hob,*
permitting a straight draw from the mould!



Speed Mix,
by Knapp-Monarch

Selector Switch Dial, *by Kurz-Kasch*

letter-perfect

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Kurz-Kasch

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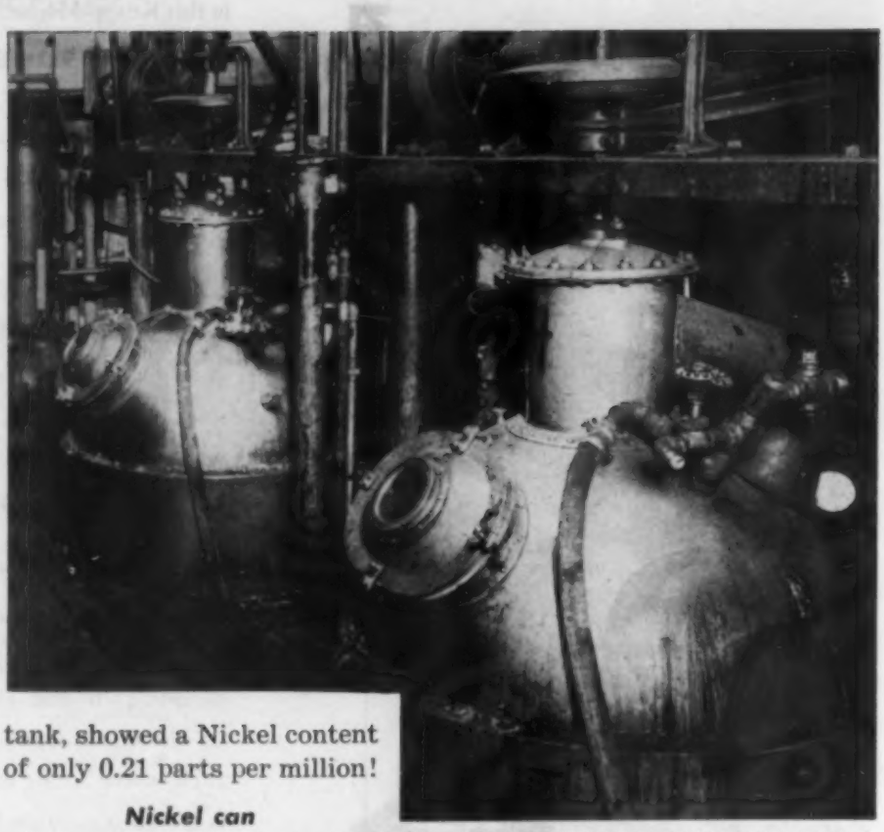


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Nickel's high degree of corrosion resistance keeps metal pick-up down; it assures purity, uniformity and color protection during all stages of production, handling, transportation and storage.

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TYPICAL PHENOL STORAGE TANK built of light-gauge Nickel sheet, reinforced with steel. Analysis of phenol after a month's storage showed only 0.21 parts per million of Nickel. *Photo courtesy Whitlock Mfg. Co., Hartford, Conn.*

THE INTERNATIONAL NICKEL COMPANY, INC.
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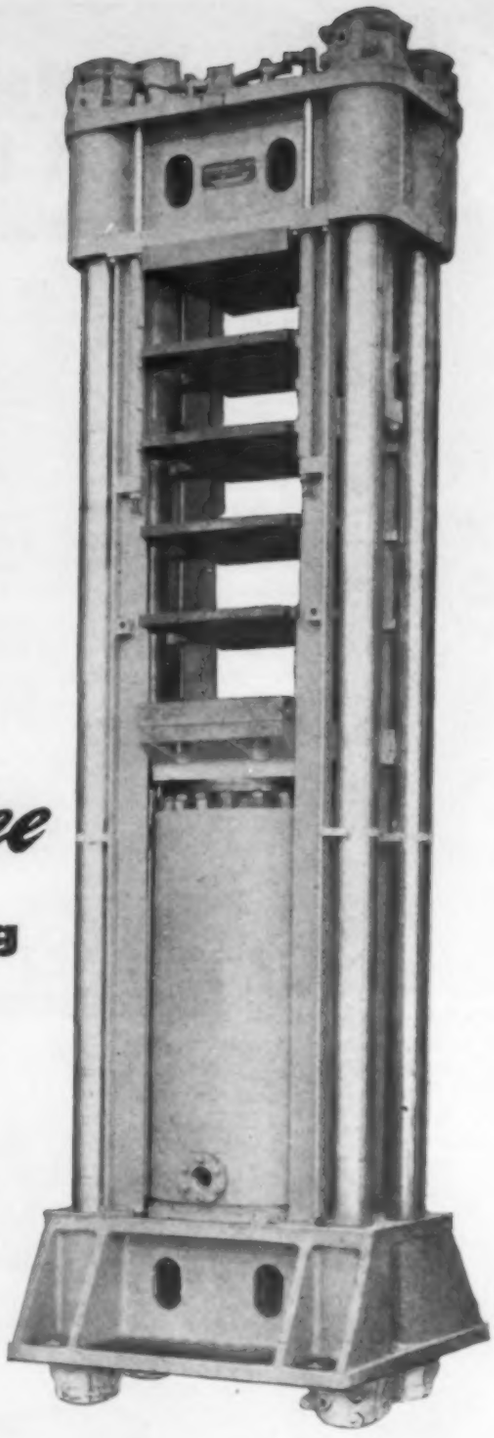
Stokes makes Semi-Automatic and Automatic Molding Presses, Plunger Presses, Closure Presses, Preforming Presses, Industrial Tabletting and Powder Metal Presses, Vacuum and Special Processing equipment, Water Stills and Special Machinery.



These switches are typical of the precision parts made on Stokes fully automatic plastics molding presses.

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Battery Case

Largest Single-Shot of Polystyrene ever molded!

MADE BY STOKES MOLDED PRODUCTS, INC.
Subsidiary of Electric Storage Battery Company

To our knowledge, this battery case is the largest single-shot of polystyrene ever molded. It contains 9 pounds 2 ounces of Koppers Heat-Resistant Polystyrene 8. The dimensions are 11 x 8½ x 12 inches with an average wall thickness for the case of ¼ inch.

Hundreds of other battery cases have been molded of Koppers Polystyrene because of its excellent combination of properties. It resists all concentrations of battery acids, has extremely low water absorption and is considerably lighter than materials previously used in battery cases.

The electrical properties of Polystyrene 8 are excellent and its heat resistance under A.S.T.M. test D 648-45T is 204°F.

In addition to all its superior qualities, the cost of Polystyrene 8 is low. That's why it is used for so many plastics products from kitchenware to the most modern refrigerators.

Koppers Polystyrene is made in three types—

- **Koppers Polystyrene 8,** the heat-resistant polystyrene.
- **Koppers Polystyrene 7,** the general purpose type.
- **Koppers Polystyrene 3,** the lubricated type for fast, easy moldability.

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PLASTOLEIN 9715

Although resinous in nature, has a low viscosity which makes possible the preparation of free flowing organosols and plastisols. High efficiency, excellent low temperature performance, negligible volatility and good oil resistance make Emery Plastolein 9715 an ideal plasticizer for PVC. For very soft stocks, Plastolein 9715 may be combined with chemical plasticizers such as tricresyl phosphate, dioctyl phthalate, etc.

Polyvinyl acetate compounds containing Emery's Plastolein 9715 are very flexible, tough and clear.

Recommended for adhesives, oil-resistant paper coatings, cellophane lamination, etc.

PLASTOLEIN 9058

The 2-ethyl hexyl ester of azelaic acid has a number of outstanding properties which make it an ideal primary plasticizer, particularly for the vinyls. Among these are low volatility and high water-resistance. It imparts excellent low temperature flexibility to films which are clear, free from haze and possess excellent tear strength.

PLASTOLEIN 9050

Chemically, Plastolein 9050, the 2-ethyl butyl ester of azelaic acid, resembles 9058. An excellent primary plasticizer for the vinyls, 9050 has many uses in films and sheeting. Like 9058, Plastolein 9050 is recommended especially for Organosols and Plastisols.

PLASTOLEIN 9055

The diethylene glycol ester of pelargonic acid, Plastolein 9055 is a solvent type plasticizer which combines a high degree of flexibility over a wide temperature range and exceptional performance at low temperatures. Films possess high tensile strength—good elongation.

PLASTOLEIN 9250

Plastolein 9250 Tetrahydrofurfuryl oleate, a low cost plasticizer with outstanding low temperature characteristics, is especially recommended for blending with phosphate type plasticizers to improve drape, light and heat stability. It is an excellent viscosity depressant for organosols and plastisols as well as an internal lubricant for calendering compounds.

MODERN PLASTICS

VOLUME 26 APRIL, 1949 NUMBER 8

So You're Going to Buy a Mold!

A non-technical summary of the factors which affect mold costs, presented to help the layman get the best possible mold for his investment



A SOURCE of constant irritation to buyers of molded products and parts, to custom and proprietary molders, to "consumer" molders who mold their own product parts, in fact, to all buyers of molds as well as to reputable mold makers, is the fact that mold quotations are often apparently senseless.

Dealing with mold makers through a custom molder who will prepare detailed mold engineering drawings and specifications, the end user of plastics pieces will get quotations in a reasonable price range; but a direct buyer of a mold who sends only a product drawing or a model to a random-picked list of mold makers is apt to receive estimates ranging from say $2000 to $4000—and for the same number of cavities! If he orders from the lowest bidder he can expect sure grief; if he takes the highest bid he'll worry about whether he has been a sucker; if he takes a middle bid he could still be wrong.

This matter is especially discouraging to enterprisers with ideas for plastics items or applications who attempt to assess the cost and market economics of such ideas before arranging financing. Others directly affected are some men in the toy, premium, and similar fields who prefer to buy their own molds and place them with different custom molders at advantageous "down" periods when prices for press time may be low. Still others concerned are proprietary molders who haven't been long enough in business to develop adequate engineering facilities and who are working on low-margin products. But the irritation is not confined to tyros: even long-established custom molders supplying engineering drawings receive mold estimates they know to be absurd—on either the high or the low side.

The key to mold costs

Chief reason for absurdly high mold quotations is that the quoter doesn't want the job in question, either because of the grief involved, the reputation of the buyer for frequent changes in design, or the fact that his plant is loaded with work. Another reason for a very high bid may be because not sufficient information has been supplied to the mold maker and he quotes high to hedge against unknown factors.

Absurdly low quotations are usually "guesstimates" by toolmakers who don't know their own costs, who have little overhead, job out many of their operations (heat-treating, for example), work for low wages themselves, and can't be held to financial responsibility in case their guarantees are called. Such plants are likely to have to live on bargain business.

What, then, is the mold buyer to do?

The best advice that could be offered those in a position to do so is to work through a custom molder, who will do the basic engineering, order the mold, and maintain it. For those not in a position to use a custom molder, an examination of mold making as a business may be in order. At least it can provide criteria on which to judge bids—and on which to determine how far a buyer may go in negotiating for lower mold costs after first bids are in.

(*Please turn to page* 62)

How to Get Lower Mold Costs

THE RIGHT WAY

1—Design the product so that cavities may be hobbed. Eliminate undercuts so the mold will not require side draws or cam action.

2—Keep inserts to a minimum.

3—Put radii on all corners and soften the angle of all sharp curves.

4—Allow adequate wall thicknesses and make them uniform to lessen the necessity of close tolerances and extra machining.

5—Decide on the plastic material to be used and have the mold designed for that material.

6—Specify the molding machine to be used on the job and don't switch machines. Don't order a mold of a size beyond the capacity of the machine on which it is to be run.

7—Design the plastic piece with straight parting lines that can be ground off by machine rather than worked by hand.

8—Make all design changes in the blueprint or model stage. Freeze design before the mold maker starts to cut metal.

9—Take your molder and your mold maker into your confidence at the time the "product" is being designed; they'll figure then any safe savings that can be made in mold costs without increasing piece cost.

10—Supply full information for bids: size and weight of piece, material to be used, length of run, required rate of delivery of molded pieces, type and size of plastics press on which mold will operate, finished desired, date of delivery of mold, other elements (if any) in final product assembly. Better still, furnish, or have your molder furnish, complete drawings of the mold.

The first simple fact to be remembered is that some plastics mold more easily than others. However, it is not wise to pick a material simply to get a lower mold cost. And it is most unwise to switch materials after the mold has been actually built.

The second important fact, and one frequently forgotten by direct buyers of molds, is that the molds are the working tools of the maker of the plastic product—NOT of the molder. The quality of the mold has a direct bearing on the quality *and price* of the molded piece. The better the mold the better the piece. And the lower the price per piece!

The parts of a mold

Of the more direct elements in mold making costs the first is, of course, the *steel* or other metal used. At least 10 types of steel are used in mold making, at prices ranging from 7 to 50¢ a pound. One mold maker carries in stock 51 types, the most expensive being $1.12 a pound. In a television cabinet mold, steel may account for a high percentage of the cost; in a toy, a small percentage. Selection of steels to be used is a matter to be decided between the molder and the mold maker.

As many as four different steels may be used in various parts of a complete multi-cavity mold. In some cases, other metals are cast by centrifugal or standard methods; some molds are produced by hot hobbing beryllium copper. Each mold must be considered as a separate engineering problem.

The hob is a "male" piece of engraved steel used to force cavities of the same shape into soft steel billets. Hobbed cavities are much cheaper than hollow machined cavities. A hob cannot be used where undercuts are required in the piece, unless extra machining is done on the cavities.

The cavities are made by the hob, then placed in the frame or chase.

Forces or cores are the male dies, one for each cavity, sometimes machined from a master on a duplicating engraving machine and sometimes milled from a drawing.

Ejector or knockout pins are required to force the molded pieces from the mold. There are many kinds, some of which are used exclusively on molds for certain makes of injection machines.

Hand work in finishing molds increases over-all costs and should be kept to minimum commensurate with desired results





Preparing to hob a cavity in soft steel. Costs can be kept down by hobbing cavities, but undercuts should be avoided

Cam actions are used in certain complicated molds to allow side as well as face opening. They are expensive but necessary in some cases.

The mold frame is generally in two parts, one part holding the cavities, one the forces. In the frame for an injection mold or in separate bars in the face of the mold are the *runners,* channels which carry the plastic resin to the *gates* which are the openings into the cavities. The runners start at the *sprue* or scrap pull-out. All these frame parts are generally made of hardened steel for strength under pressure, and accuracy in long use. The use of soft steel in some frame parts can save money in mold cost, but may result in a short-lived mold. On the frame are *guide pins,* which align the two mold halves when they are closed.

Mold-making processes

To make steel into the above mentioned mold parts takes a lot of equipment, a lot of skill, and time. Cutting, drilling, grinding, fitting, polishing, annealing or softening, forging, hardening, and plating equipment of many types are used in a big mold shop, besides the hobbing presses and duplicators.

An example of why some molds cost more than others may be illustrated by the case of a part which had to be 16½ in. wide and for which a high-quality long-run mold was required. The cavity block had to be forged. If the part had been designed 16 in. wide it could have been made from a standard mold steel size—at great savings. An unscrupulous mold maker would make it from boiler plate at low cost and at risk of trouble in the molding plant.

Another wastefully expensive use of mold makers' equipment is where a mold buyer changes design of a section of the piece. If this happens in the early stages of metal cutting, the mold can be thrown away or re-machined to incorporate the changes. Worse, if a change in piece dimension is made after steel has been hardened, the whole piece may have to be annealed or softened, then re-machined and re-hardened. It may come through warped, oversize, or undersize. If welding has to be done there may be pits caused by trapped air. Polish may be affected. Mold costs will rise and the molder may have to ask for a higher price per piece.

Mold maker's services

To perform the work of mold making, the companies involved have to maintain services, all of which enter into mold costs. (*Please turn to page* 64)

How to Get Lower Mold Costs

THE WRONG WAY

1—Use soft steel rather than hard for runners (you'll get more flash very soon), and for the chases or nests (you'll waste plastic material and get a new size of molded piece—and finishing costs will rise sharply).

2—Don't bother to put a hard bushing around the sprue pull (you'll have to put one in six months later).

3—Leave out guide pins, letting the mold ride the press (you'll wreck your ejector pins and they in turn will elongate the ejector pin holes and the whole mold will get out of alignment and cause all sorts of trouble).

4—Figure 120% of the press capacity in designing the mold. If 10 cavities are logical, put in 12 (you'll have some unfilled cavities with more rejected pieces and higher piece cost, or the press will have to be "hopped up", an unsatisfactory procedure which also raises cost).

5—Get really generous about tolerances in an effort to cut machining time on the mold (your pieces will require more finishing and if they are to be used in a later assembly you'll have trouble with misfits there).

6—Order a mold for an easily-molded plastic; then demand the piece in a material more difficult to mold (this can slow down or stop your job, raise the piece price, and in general give you poor pieces).

Engineering—most well-established mold makers maintain engineering departments which can plan a mold from even a rough sketch of a product and can work out all problems with the molder. From better custom molders the mold maker receives detailed blueprints; but the engineering department must be maintained for direct buyers and hence must be paid for by them.

Estimating—without competent cost analysis the customer gets "guesstimates." Some absurdly low bids are the result of this, as was mentioned above.

Scheduling—to keep work flowing evenly to the high-overhead machine tools, to keep costly hand work at a minimum, to eliminate down time, and to assure firm delivery is the task of the scheduling department. It stands to reason that a rush job will cost more than a slow one, but a scheduled plant is more likely to take rush orders in stride than one operating hand-to-mouth and offering bargains in slack periods.

Inspection and testing—the better mold makers are financially responsible and guarantee that their molds will produce successful pieces on the machines for which they were ordered and in the plastic material specified. Most of them have presses on which many of the molds are given a preliminary run-in before delivery to the molder. All of them have service men.

The better-established mold maker has had experience in making molds for many products for many molders and for many types of plastics. He has to maintain an organization to serve his customers. His quotations will be based on sound facts, backed by guarantee.

To do business with him the following suggestions are made: a) request quotations only from established mold makers, b) assess the bids alongside the experience and financial responsibility of the bidding mold makers, c) save on mold costs only where the saving will not lower the quality of the pieces at any point in the run, nor raise their price. See the panels on pages 62 and 63.

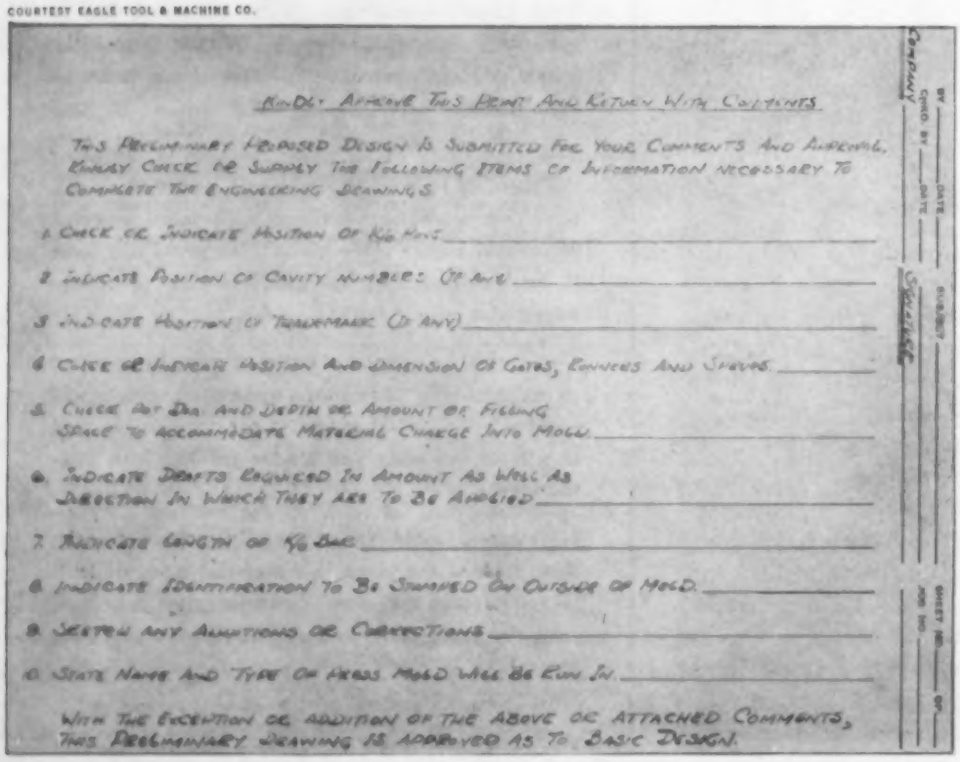
A salutory piece of news is that mold costs at present are not rising, in many cases are lower than last year for the same type of job. Steel for molds is in fair supply. Mold deliveries are good today.

A duplicator in use. An efficient mold shop must be equipped with adequate facilities for doing accurate work

COURTESY GEORGE GORTON MACHINE CO.



COURTESY EAGLE TOOL & MACHINE CO.



KINDLY APPROVE THIS PRINT AND RETURN WITH COMMENTS

THIS PRELIMINARY PROPOSED DESIGN IS SUBMITTED FOR YOUR COMMENTS AND APPROVAL. KINDLY CHECK OR SUPPLY THE FOLLOWING ITEMS OF INFORMATION NECESSARY TO COMPLETE THE ENGINEERING DRAWINGS

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2. INDICATE POSITION OF CAVITY NUMBERS OF ANY
3. INDICATE POSITION OF TRADEMARK (IF ANY)
4. CHECK OR INDICATE POSITION AND DIMENSION OF GATES, RUNNERS AND SPRUES
5. CHECK OUT DIA. AND DEPTH OR AMOUNT OF FILLING SPACE TO ACCOMMODATE MATERIAL CHARGE INTO MOLD
6. INDICATE DRAFTS REQUIRED IN AMOUNT AS WELL AS DIRECTION IN WHICH THEY ARE TO BE APPLIED
7. INDICATE LENGTH OF K.O. BAR
8. INDICATE IDENTIFICATION TO BE STAMPED ON OUTSIDE OF MOLD
9. SKETCH ANY ADDITIONS OR CORRECTIONS
10. STATE NAME AND TYPE OF PRESS MOLD WILL BE RUN IN

WITH THE EXCEPTION OR ADDITION OF THE ABOVE OR ATTACHED COMMENTS, THIS PRELIMINARY DRAWING IS APPROVED AS TO BASIC DESIGN.

Company

BY ____ DATE ____
CHKD BY ____ DATE ____
SUBJECT ____
SHEET NO. ____ OF ____

When the end user of plastics pieces submits his mold making problems, there are usually many details missing. The form at left shows how one mold maker goes after these details. Such thoroughness in the planning stages eliminates costly design changes as mold approaches completion



Top left — complete new Schick shaver. Top right — cord in polystyrene ring. A — urea case. B — urea cover. C — cord ring. D — polystyrene shearing head guard. E — nylon rubbing blocks. F — urea "whisk-its." G — Plexene spacer block. H — Rogers Board actuating lever bushing. I — phenolic bearing support. J — starting button of red phenolic

New Schick Shaver

Close cooperation between manufacturer, designer, and molder produces a precision unit in which a number of plastics have important uses

by LES GUILMART* and J. HARRY DUBOIS†

SEVEN plastic materials were selected in the design of the new Schick "400" Shaver, taking full advantage of the special properties of each. Each plastic part carries a substantial portion of functional and assembly importance; several parts carry the burden of presenting outstanding appearance in combination with functional use.

The resulting product is an excellent example of the value gained by a careful selection of the proper plastics materials and a highly engineered product design.

However, as Norman Gray, chief engineer of Schick Inc., Stamford, Conn., puts it, "It isn't design alone nor material, nor styling that makes a problem-free product from a 'pesky' one. Many, many times it is the molder who can change your headache to a smile."

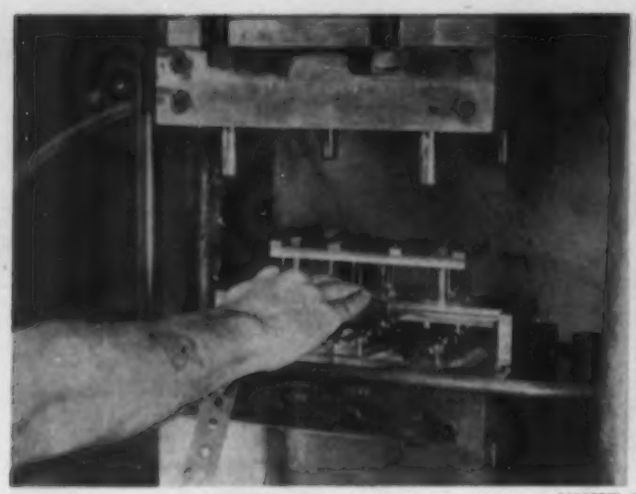
Design importance

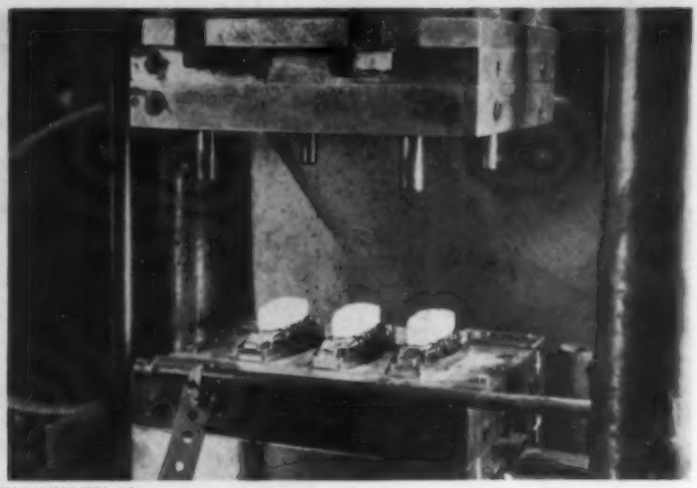
Of major importance in a highly competitive market is design and appearance. The product styling of the new Schick was done by Raymond Loewy who worked hand in hand with Mr. Gray. To facilitate Mr. Loewy's analysis of the problem, the molder built dies to illustrate the various knurls that were suggested for the case exterior. Hobs for the case and cover were checked for appearance by the designer until the exact contour desired was developed.

Models were prepared from cast plastics to prove the appearance design and to make sure that each exterior detail was correct before the product drawings were made. The case has a fine exterior knurl, of pleasing appearance and "feel", to provide a good shaving grip. The cover styling involves a colorful nameplate and a single crisp line. The red phenolic starting button contrasts with the ivory color of the case.

The industrial designer's models were converted into product designs and product drawings by Schick engineers working closely with the plastics and tool engineers to make sure that each detail represented the best possible engineering practice. Sample molds for each part were rushed through in record time to prove the final product design and to supply the initial trial assembly lines. This step permitted the production molds — 20 of them were

*Product engineer, Schick Inc., Stamford, Conn.
†Executive engineer, Shaw Insulator Co., Irvington, N. J.





COURTESY SHAW INSULATOR CO.

Insert loader indexes in the three-cavity mold and places all 15 inserts in position on mold pins in a matter of seconds

After inserts are in place, ivory colored urea preforms, which are similar in shape to the finished case, are loaded on the mold forces

made from 5 tons of steel — to come through ready for operation. With each part carrying a heavy assembly burden, the tolerances had to be close; for example, because of the number of cavities required to carry the production, 169 combinations of cover and case assembly are possible. Each part must mate perfectly with any other part or breakage will occur during assembly.

Two different material shrinkage factors were used, based on experience gained with previous models; the results were excellent. It would have been impossible to design and build molds for this program without an intimate historical knowledge of material behavior. No handbook values are sufficiently accurate for such work.

Buyer survey determined color

The case, cover, and "whisk-its" are molded of ivory urea, selected because of its color and age stability under a variety of operating conditions. The ivory color was chosen as the result of an extensive survey which disclosed that ivory was the overwhelming color choice of the public. The case forms the bedplate for the motor, and four molded-in inserts provide for fastening the motor with screws. A fifth insert is for the cutting head screw.

Small three-cavity compression molds were designed for the case and cover to gain quality control. Four individually shaped cutters had to be used on the case hob because of the varying radii that the knurl followed. It was decided to use the small three-cavity molds because large molds were found to introduce too many dimensional and contamination variations for a product having such exacting requirements. By using insert loaders, these small molds are operated on a fast loading cycle that insures a maximum output per cavity per day. When large molds were used, the load time per cavity was greater and actual efficiency was less.

Hand finishing methods used on previous models and in the initial production runs have been supplanted by a custom built rotary unit which sands each parting line. Absolute uniformity of parting line finish is essential when appearance is critical; this mechanical unit eliminates variations.

The ease and economy of the "whisk-it" assembly to the shaver is a fine example of the satisfactory result that can be attained when design engineers work closely with the molder. The angular hinge recess in the "whisk-its" eliminated the necessity of an insert or expensive hinge fabrication and was made possible by unique mold design whereby the part is ejected from the force plug on a 50° angle to the mold parting line instead of the customary right angle. Eight-cavity compression molds are used for the "whisk-its." Electrical interlocks prevent pin breakage resulting from non-sequence operation of the mold.

Bearing alignment

The nucleus of the mechanical portion of the shaver is the bearing support. A "U" shaped piece incorporating seven inserts, it is molded of cotton flock filled phenolic in eight-cavity transfer molds. Each leg of the "U" supports a porous bronze shaft bearing which is pressed into a molded-in sleeve. Because of the extremely close running clearance between these bearings and the shaft (0.0001 to 0.0002 in.) every precaution must be taken to ensure bearing alignment. The sleeves are machine-bored in line and the bearings pressed in.

Four post inserts in the top leg of the bearing support are provided for mounting the contact arms and springs. The plastic furnishes ample electrical insulation between these parts as well as adequate operating rigidity. A molded-in sleeve bearing is the pivot for the shearing head drive. Sliding trays are used to facilitate loading the complex inserts.

The actuating lever bushing of the shaver bears the main brunt of transforming the motor power output from the circular motion of the shaft to the back and forth motion required in the shearing head. In so doing, this bushing is required to withstand some 17,000 blows per min. from the eccentric on the shaft. The Rogers Board material used here is superior even to steel from a wear standpoint in this application and greatly contributes to smooth and more quiet shaver operation. It also provides electrical insulation.

Light refraction used

A good example of the excellent appearance effects which can be obtained with plastics through ingenious design is found in the clear polystyrene cord ring furnished with each shaver. In this instance, the skillful usage of shallow grooves in the inner and outer surfaces of the part exploits the light refractive properties of polystyrene and makes the ring an eye-catching object.

The shearing head guard is molded of clear polystyrene. Because it is slightly flexible, the guard can be readily ejected from the mold force plug in spite of the undercut which is necessary to provide a good detent on the shearing heads.

The starting button is molded from red phenolic compound in a transfer mold. A spacer block in the shearing head assembly is molded of Plexene. Laminated phenolic stampings are used for the motor coil bobbin. Stamped nylon pieces form the rubbing blocks on the contact arms, replacing laminated blocks used on previous models. In this application, nylon was found to give longer life and quieter operation in a series of life tests which justified this substitution of a more costly material.

The Schick shaver employs all the many excellent properties of the plastics used and, by judicious design of the components, the assembly becomes a simple putting together of freely interchangeable components which are made at low cost with modern production tools.

Credits

Case, cover, "whisk-its" — urea — American Cyanamid Co., New York, N. Y.; molding — Shaw Insulator Co., Irvington, N. J.; molds — Liberty Tool & Machine Co., Irvington, N. J. Bearing support — cotton flock phenolic — Durez Plastics and Chemicals, Inc., North Tonawanda, N. Y.; molding — Shaw Insulator Co.; molds — Liberty Tool & Machine Co. Actuating lever bushing — Rogers Board — Bakelite Corp., New York, N. Y.; molding—Shaw Insulator Co.; molds — Liberty Tool & Machine Co. Starting button — red general purpose phenolic — Bakelite Corp.; molding — Shaw Insulator Co.; molds — Liberty Tool & Machine Co. Rubbing blocks — nylon — E. I. du Pont de Nemours & Co., Inc., Arlington, N. J.; fabrication — The Polymer Corp., Reading, Pa. Cord ring — injection molded of polystyrene by Plastic Manufacturers Inc., Stamford, Conn. Spacer block — Plexene — Rohm & Haas Co., Philadelphia, Pa.; injection molded by Auburn Button Works, Auburn, N. Y. Shearing head guard — injection molded of polystyrene by Auburn Button Works.

Stripping of "whisk-it" parts at 50° angle permits molding of angular hinge recess. Electrical interlocks prevent pin breakage

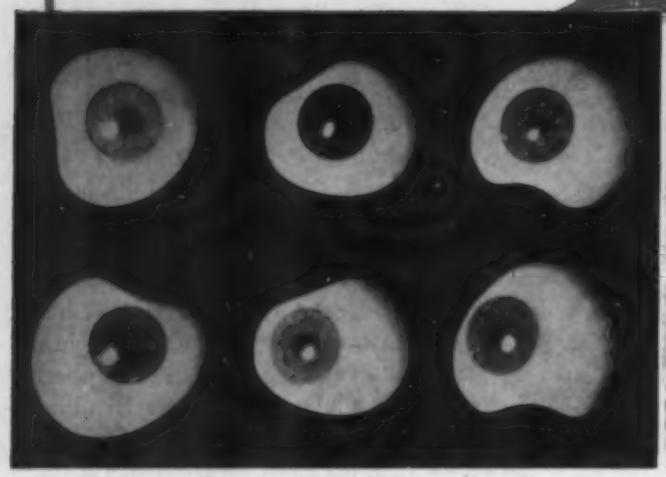
Custom built rotary finishing fixture sands all parting lines uniformly. Cams rotate work and position part correctly at each work station

COURTESY SHAW INSULATOR CO.





Rx Molded Acrylic Eyes





ALL PHOTOS EXCEPT NO. 7, COURTESY ROHM & HAAS CO.

1 The all-acrylic eyes are made in 50 standard sizes and shapes. Over-all size ranges from 22 to 30 mm., and frontal radius of curvature varies from 12 to 16 mm. In addition, eyes differ as to shade of sclera, position and size of iris, size of pupil, and color of iris. Each iris has three colored portions

2 First step in manufacture of the eye is to compression mold the body in a Carver Laboratory press. Knife edge is used to separate the piece from the mold. Specified iris position is then marked on body, which is counterbored with end mill to a depth of about 3 mm. Body is veined according to order

MOLDING operations are usually considered economically suitable only for the production of large quantities of identical items. An exception to this general rule is the use of compression molding to produce acrylic artificial eyes, which are made up to prescription one at a time. Although the eyes vary in size, shape, and coloring, the manufacturing process has been broken into a series of steps so that the eyes can be molded, with even the vari-colored irises molded in.

The method of producing these all-acrylic eyes is explained in the accompanying pictures and captions. The process, developed by Galeski Laboratory, Richmond, Va., takes artificial eye manufacture out of the handcraft class by standardizing sizes, shapes, and colors so that a fitter can write out a prescription for an artificial eye which will fit the patient exactly and will also match the appearance of his good eye.

Fitters (oculists, optometrists, or opticians) who use the Galeski method are furnished with a fitting set which contains 50 completed eyes. These serve as samples of different eye body sizes and shapes, and as samples of 50 of the available colors. There are 50 additional color samples (which are not complete eyes) in the set. The fitter tries the various sizes until he finds one which is comfortable for the patient and which retains the same lid opening as the good eye. He then picks the desired colors, measures such variables as iris size, iris position, etc., and writes out the prescription.

The prescription specifies the size, shape, and thickness of the finished eye; the position of the iris; the size of the iris; the size of the pupil; the color of the limbus (the periphery of the iris); the color of the main portion of the iris; the color of the center portion of the iris (nearest the pupil); the shade of the sclera (the "white" of the eye); and amount and coloring of veining on the sclera.

The hardest variables to standardize are the colors. Galeski has solved the problems involved by using colored acrylic molding powders. About 30 different transparent, translucent, and opaque colors are used. Two or more of these colors can be combined to get an almost infinite variety of eye colors. Each eye color is reduced to an exact formula which specifies the exact weight of each powder used and the size of the granules.

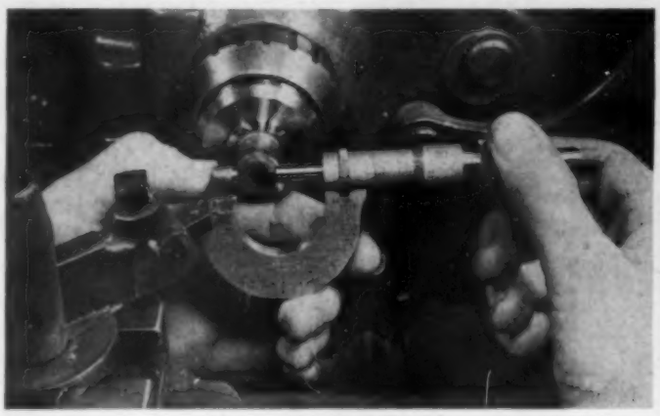
By molding in the colors and molding a transparent coating over them, Galeski can make an artificial eye which has depth of color appearance much like that of the human eye. Because the eye is all acrylic, it is unaffected by body acids, and is virtually unbreakable.



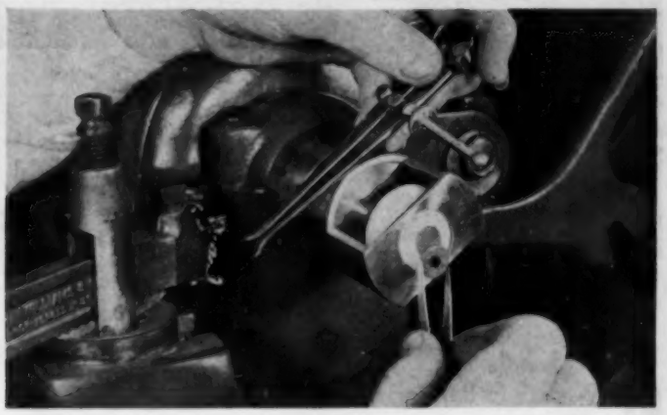
3 Limbus or periphery of iris is made in form of a tube about 40 mm. long with a 14 mm. o.d. Wall thickness is varied by using different plungers in the mold. Limbus is formed in mold, but is not compressed. Resultant hollow cylinder is then filled with the material for main portion of iris, and a smaller plunger



4 Limbus and main portion are bonded, but not compressed, in mold. Plunger is then removed and material for central portion of iris is inserted. Entire plug is then compression molded in Carver Laboratory press. Asterisk shape of center becomes irregular during molding



5 Iris plug is then drilled longitudinally, black acrylic rod is inserted, and plug goes back into mold to weld the pupil in place. The pupil rods are molded seven at a time, in three different sizes. Iris plug, complete with pupil, is turned to correct diameter to fit into counterbore in body



6 Iris is made by slicing a piece about 1½ mm. thick from the molded iris plug. Thickness of the slice can be controlled to vary the color effect. One plug makes six or more irises. Iris press-fits into the hole counterbored in the eye body. Remainder of plug is kept for use in filling duplicate orders

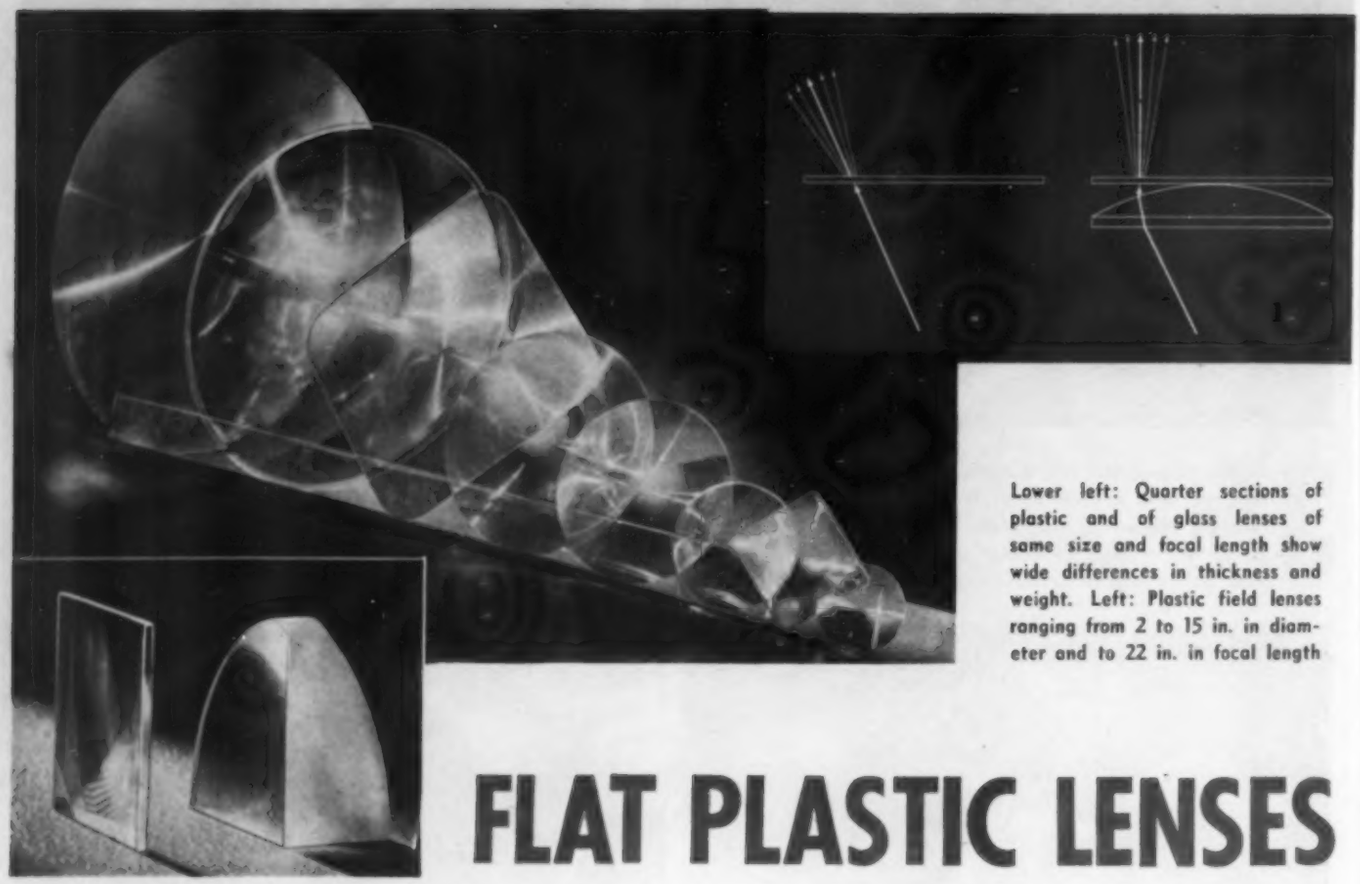
7 Eye body with iris disk in place is then placed into mold with sufficient transparent acrylic molding powder to form a transparent cover and cornea for the eye. Total weight of material needed to compression mold an eye of given over-all thickness is determined by formula

8 Eye is then placed in special lathe holder, profiled, and rough polished. The next step is to edge the eye to the proper shape with high speed midget mills or rotary files. Size and shape must be kept to close tolerances and iris must be kept in exact position specified. Final polishing is done on a soft rag buff

PHOTO COURTESY FRED B. CARVER INC.







Lower left: Quarter sections of plastic and of glass lenses of same size and focal length show wide differences in thickness and weight. Left: Plastic field lenses ranging from 2 to 15 in. in diameter and to 22 in. in focal length

FLAT PLASTIC LENSES

NEW plastic lenses which look like flat sheets of plastic, yet which perform precisely as do conventional glass photographic lenses, have been developed by the Eastman Kodak Co.

These new lenses are not picture-taking lenses. They are condenser-type or field lenses whose primary purpose is to gather the light from some light source (such as a projection lamp) and spread it evenly across the entire field. The lenses are already being used in Kodak's new Kodak Reflex II Camera and the new Kodaslide Table Viewer.

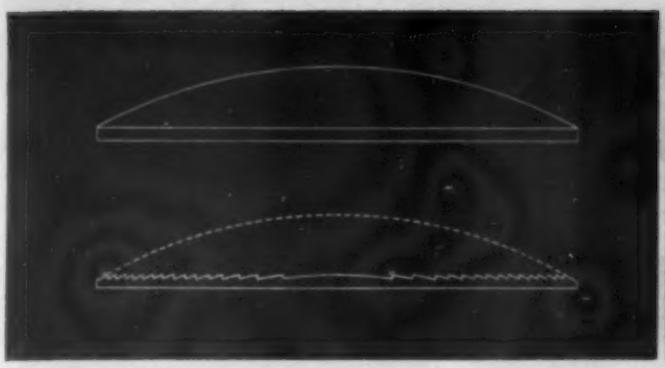
The advantage of using such a lens in a camera's viewing system lies in the fact that it increases the over-all brightness of the image on the ground glass by 250% and corner brightness by more than 1000 percent. The lens eliminates "hot spots" in the center of a ground glass or viewing screen.

The new lens is produced by cutting a brass mold with many small circular grooves (200 or more to the inch) and pressing the mold into cellulose esters, (including Kodapak sheet and Tenite), polystyrene, vinyl resins, or methyl methacrylate. Since these materials are subject to abrasion, however, the lenses are mounted within the camera or viewer where they are protected.

The manner in which the mold is cut determines the effectiveness of these new lenses, since the shape of the ridges in the plastic establishes the characteristics of the lens. These ridges vary considerably in shape between those at the edge and those near the center of the lens. The sides of the ridges near the edge are tipped up at a steep angle—which duplicates the steep angle of the curved surface of any conventional glass lens—while those near the center are almost flat as is the center of any conventional lens.

Actually what the ridges do is reduce the arc of the lens to a generally flat plane. There are 200 or more ridges to an inch in the new lens, and thus the arc is cut into very small fragments. Light entering the bottom of the lens, and passing out through the arc-sided grooves, is controlled precisely as it would be by a conventional type field lens. As a result, by controlling the shape of the ridges in the new lens, the characteristics and performance of any field lens can be duplicated or improved upon.

The advantages of these new plastic lenses, however, do not lie alone in the fact that they can improve upon the performance of glass lenses. Other advantages of the plastic lenses are that they weigh so very little and are so thin that their weight and volume do not have to be considered in their use; that field lenses of a size which would be almost impossible to manufacture by conventional methods of glass manufacture can be produced; that the plastic lenses may be added to certain conventional





Sketch 1 shows, at left, how light ray is diffused by a ground glass but its direction unchanged; at right, how field lens redirects ray and brightens illumination of ground glass. 2 shows why flat plastic lens (tiny segments are exaggerated) duplicates action of conventional lens. In 3 is shown how a flat plastic field lens redirects light, just as does a conventional type lens

camera and projection systems without special design or re-design of equipment; and that—from the standpoint of technical qualities—spherical aberration (a common defect in simple lenses) has been almost eliminated.

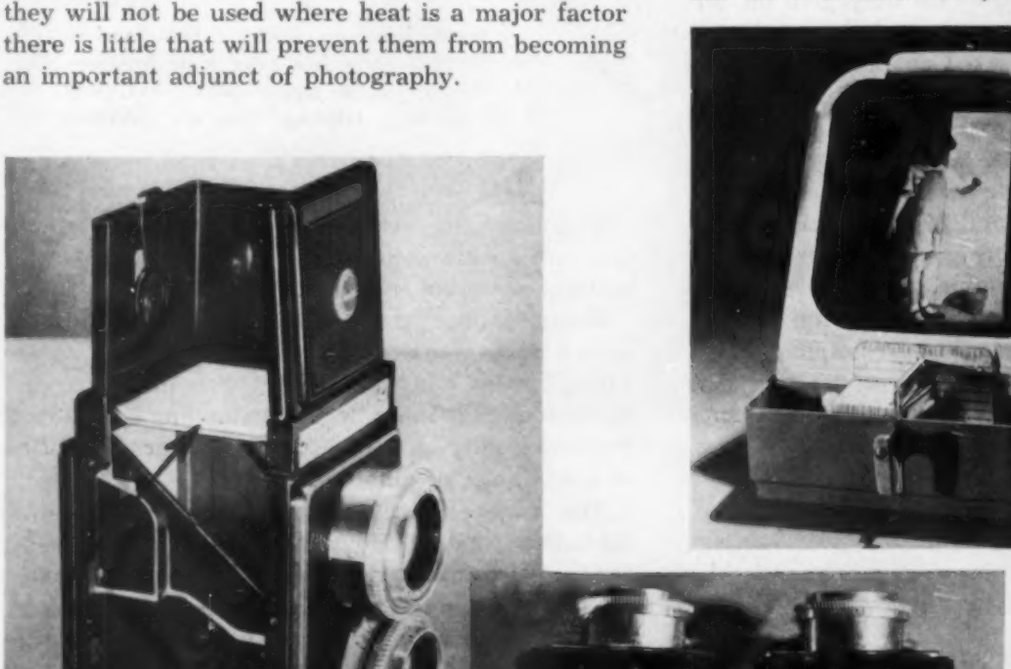
Since these characteristics make possible the addition of these lenses to camera and projection systems without extensive re-design of equipment, and since the effect of the lenses is tremendous in brightening any field, it is expected that they may well have a wide effect on photographic equipment. The only major limiting factor in their use is the effect that high temperatures have on most plastics, but since they will not be used where heat is a major factor there is little that will prevent them from becoming an important adjunct of photography.



Magnification of model's face shows how flat field lens can pick up and spread light across the entire field

Flat lens covers only half of viewing screen to show how it eliminates "hot spot" in the center





Far left: Flat lens (arrow) in camera beneath and in contact with the ground glass. Left: Same subject is viewed in ground glass of two reflex cameras, one with and one without flat field lens

Vinyl Inflatables



Appealing features and other multi-colored details of this toy rabbit, a vinyl inflatable produced by Ideal Plastics Corp., are silk screened





COURTESY BAKELITE CORP.

Two non-sinkable boats, which can be deflated and carried in small space, are being made by Bilnor Corp. The smaller one, at top, is 56 in. long; larger one is 72 in. long. Inflating valves are automobile type

USE of elastomeric vinyls for inflatable products, especially toys both small and large, has become big business. This fact is substantiated by a survey of a dozen of the leading manufacturers in this field who cooperated in supplying data on their production, design, and quality control. A study of their products further shows that today's inflatables are quality items. No longer do they give off an obnoxious odor; improved inks specially developed for decorating vinyls are used to provide permanent, non-fading decorations; film no thinner than 0.012 in. insures a sturdy product which will withstand a great deal of abuse.

The answers given by the manufacturers also indicate that, although the total business during 1948 was twice that enjoyed during 1947, their production for 1949 will again double. This proves, first, that vinyls are doing a better job than the rubber which they replaced, and at a more reasonable price. The expansion of markets further proves that the vinyls are permitting the manufacture of many products in the inflatable class which cannot be made satisfactorily with rubber.

All but one of the fabricators covered by the survey make use of high frequency heat sealing equipment; the lone exception uses a heat and solvent method of producing the seams.

The search for new designs

One of the most important aspects of the inflatable business is the creation of new products and of new designs for established products. To this end, three-quarters of the manufacturers surveyed have expert designers working directly in-plant. The remainder make use of consultant design services, although practically all the companies at one time or another employ consultants, particularly in matters of styling and color.

Every fabricator participating in this survey stated that they use only Vinylite film, manufactured by Bakelite Corp. They are in unanimous agreement that this film is outstanding in uniform heat-sealability as well as in the important matter of a minimum of pinholes.

The number of applications of inflatables is spreading rapidly. However, the largest fields by far are toys and sporting goods from which a number of products have been selected for the accompanying illustrations to point up the scope of inflatables and indicate their vast possibilities.

Specific products

Outstanding among the newest inflatable items is a line of two portable boats first placed on the market this Spring by Bilnor Corp., New York, N. Y. The larger boat, christened Bil-Boat Sr., weighs

Become Big Business

Right: Rugged construction of heat-sealed vinyl inflatables is exemplified by Comeback Jr., made by Marty Gilman, Inc., for youngsters' football practice



Below: Whole families of Shmoos, produced in red, white, and blue vinyl film by Vanguard Corp., delight the followers of Al Capp's cartoon strip characters

PHOTOS RIGHT AND BELOW COURTESY BAKELITE CORP.





Above: This 24-in beach ball is fabricated by Doughboy Industries, Inc. A patented heat-solvent seamer welds the vinyl

Below: Mama, Papa, and Baby Bear are three of a line of vinyl nursery toys made by U. S. Fibre and Plastics Corp.



only 5 lb.; yet when its four independent air channels and double section bottom are inflated, it can safely carry five children and one adult. The pointed bow is equipped with a heavy eyelet and its strength and stamina have been demonstrated by towing the boat behind a speedboat with one adult riding in it, aquaplane-fashion, at speeds up to 35 miles per hour.

The smaller boat, named Bil-Boat Jr., and designed for children up to 16 years of age, also has a double bottom and eyelet; its sides have three independent air channels. However, in this design



PHOTOS ABOVE, BELOW, AND LOWER LEFT COURTESY BAKELITE CORP.

Right: Useful on the beach as a pillow or for fun in the water, this impressionistic denizen of the deep is fabricated by Plextron, Inc.

Left: Easter toys, involving bunnys, chicks, eggs, and similar seasonal symbols, are the latest addition to the line of inflatables designed and offered to the retail market by Vanguard, Inc.

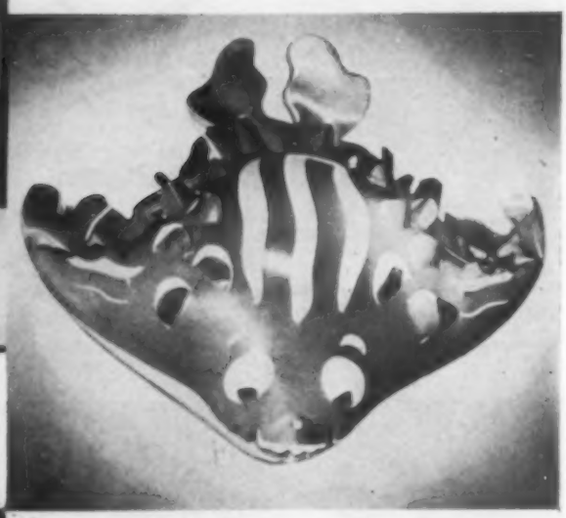




PHOTO TAKEN AT FLORIDA CYPRESS GARDENS

Left: Welcome additions to any lawn on hot summer days — for children and adults alike — are these two inflatable pools, produced by Bilnor Corp. The pools are 40 and 72 in. in diameter

Right: Turbo the Jet, one of the larger inflatables fabricated by Doughboy Industries, Inc., serves as a swimming float; more daring youngsters will experiment with its possibilities as a surf board





Left: Two character dolls produced by Transplastics Manufacturing Co., have faces made of semi-rigid heat-formed vinyl; standard flexible film is used for fabricating the rest of each of the figures

the double bottom is not inflatable. Both styles are produced with brilliant colored Vinylite for the sides and clear material for the bottoms.

The Bilnor company also produces three sizes of portable bathing pools. The sides consist of three individually inflatable rings bonded together, with the lower ring in turn bonded to the plastic bottom. The largest pool is 6 ft. in diameter and will hold water up to a depth of one foot.

One of the more appealing inflatable toys on the market springs from cartoonist Al Capp's good-luck character, the Shmoo. These vinyl critters are being manufactured by Vanguard Corp., Springfield, Mass., in white, blue, and red. Fabricated in varying sizes, they are perfect three dimensional reproductions of this popular cartoon creation.

Two companies have designed large inflatable toys for the purpose of encouraging interest in football, boxing, and general exercise for fun. Both are designed on the principle of the roly-poly doll which always manages to return to an upright position no matter how far it is pushed over. One of these, known as the Comeback Jr., was designed by Marty Gilman, Inc., Gilman, Conn. Mr. Gilman is a famed designer of football practice equipment for leading college and professional grid teams. Weighing less than 10 lb., Comeback Jr., stands 2 ft. high when inflated. The second toy of this type is produced by the Kestral Corp., Springfield, Mass., and is known as Puncho, the Fighting Clown. This roly-poly stands 4 ft. 6 in. when inflated and weighs 13 pounds. Both products are suitably decorated by means of silk screening.

Vinyl in ball bladders

Until June of last year the field of football and basketball bladders was an exclusive province of the rubber manufacturers. At that time Plextron, Inc., New York, N. Y., introduced its vinyl bladders. As is usual in the case of a product made from a new material, certain problems immediately became apparent. However, all the difficulties have been overcome so successfully that it is evident that high frequency heat sealed vinyl bladders as made today are not only equal to, but in many cases better than, the familiar rubber bladders which have been standard in this field for so many years. Unlike rubber, the vinyl film is unaffected by petrolatum or motor oils which are often used to lubricate the needle on the inflating pump.

In a series of tests run by Emtec Research Associates, 100 footballs with vinyl bladders were inflated to 15 p.s.i. and examined after 48 hours. Three footballs failed because of burst covers. None failed because of bladder defects. It is obvious from these tests that the use of high frequency welded seams in the construction of bladders results in the production of footballs which will not fail under a considerable amount of over-inflation. The footballs used in these tests were selected at random from Plextron's production line.

A surf board in the shape of a fish known as the skate and called Turbo, the Jet, has been produced by Doughboy Industries, New Richmond, Wis. The seams of this product, as well as of all Doughboy inflatables, are made by means of a patented solvent and heat process. Light and colorfully decorated, this simulated surf board is sufficiently buoyant for children or grown-ups.

Details on other inflatables of varying sizes and uses are given in the photo captions on this and the preceding three pages.

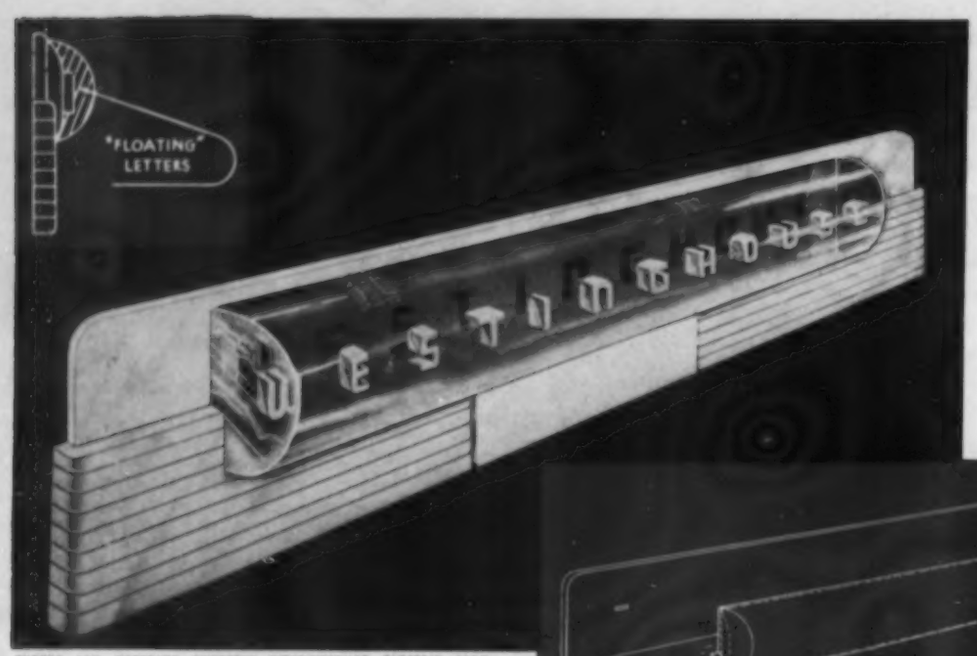
Inflated beach horses, long familiar in rubber, are now being produced in more durable, longer lived vinyl film, complete even to the reins, by Kestral Corp.

PHOTOS BELOW COURTESY BAKELITE CORP.



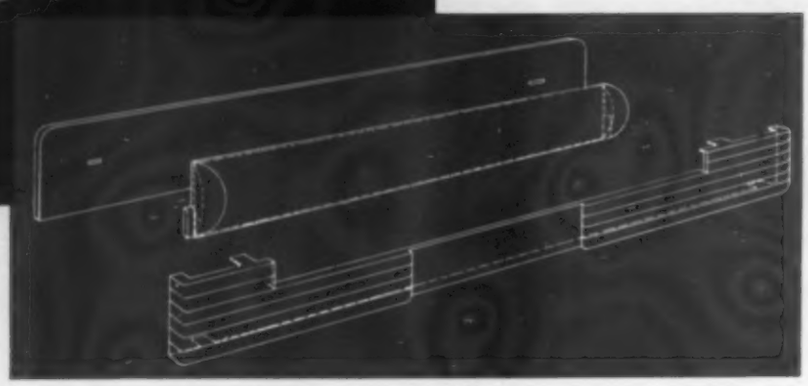


Heavy vinyl film readily withstands the battering which it receives when Puncho, the Fighting Clown, made by Kestral Corp., is attacked by a pugnacious youngster



PHOTOS AND SKETCHES COURTESY WESTINGHOUSE ELECTRIC CORP.

Letters appear to be suspended in this 10-in. nameplate, designed to be used on flat surfaces of refrigerators or similar appliances. Left sketch shows letter location



Exploded view of nameplate and bezel showing the method of assembly with lugs and slots. Tabs at top edge of bezel fit into slots in the back panel. Lugs on acrylic rod fit into slots in bezel

Three-Dimension Transparent Nameplates

The eye-catching appeal of molded-in letters and designs can be most effective only if color, contour, and method of mounting are carefully considered

by RAOUL A. LAMBERT*

THE increasing popularity of plastic nameplates and escutcheons can be attributed to the sales appeal they lend all merchandise. An attractive and correctly designed identification piece has and will continue to help decide the sale of some products over competitive items.

Although the conventional transparent and opaque plastic nameplates are widely used, one of the best methods yet devised of presenting the manufacturer and his product to the public is the three-dimension transparent plastic escutcheon. Its appearance is certainly unique. It sparkles as if self-illuminated; it has an eye-catching quality of richness; it gives an illusion of having a metal inlay imbedded in the rear. It demands attention and commands respect. It arouses curiosity in the customer to investigate further, and in so doing fulfills the purpose of a properly designed nameplate — mainly to advertise.

Considering that three-dimension nameplates are relatively new to most designers and have to be developed a great deal before reaching their peak, it still remains that a large percentage of those now in service fail to take full advantage of their possibilities. They therefore fail to convey their intended message clearly and distinctly. Two dangers are over-emphasis of the three-dimensional qualities or failure to achieve the proper depth.

Basically, all three-dimension plastic nameplates are the same; they are of clear, light-transmitting plastic, having letters and designs molded in the rear and then sprayed with paint. However, there are many factors that contribute in making a nameplate distinctive from others. Of these, the color, contour, and size of the plastic piece, and the bezel

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or method of mounting are the most important characteristics to be considered in the design.

Color

The colors to be applied to a nameplate must be in harmony with the basic color of the product for which the escutcheon is intended. Because of this, perhaps more thought should be given to the shade and color than anything else.

Some designers have had a tendency to over-use the brilliance obtained by plating on plastics. In so doing they lose sight of the clarity sought in the finished piece. The properly designed nameplate should not disturb the eye nor should it be so mixed with colors as to drown itself, as can happen if chrome plated letters are used on a gold background, or vice versa. This does not necessarily mean that the use of more than one or two lacquer colors is not wise, but rather to say that a great deal of thought and consideration should be given before specifying two or more different colored plate finishes. Multiple colors will mean multiple spraying masks and possibly extra spraying equipment and labor. All this builds up to added piece cost. The proper use of plating on a nameplate can be one of the most fascinating methods to make the nameplate attractive and to command attention.

Today, more than ever, the importance of producing a perfect nameplate has become so serious in this competitive market that some manufacturers have turned to consulting color experts. Through research and surveys, these experts are constantly receiving information on consumer color acceptance. Although this method may appear to be costly, the color choice becomes no hit-and-miss affair if reliable sources are consulted.

Contour and size

The size and shape of the nameplate will invariably be influenced by the product to which it is applied. At this point, originality plays an important part. The correctly designed nameplate should have that "far-ahead look", or else it will take its place among the mediocre nameplates. People will merely glance at it once and will not be impressed.

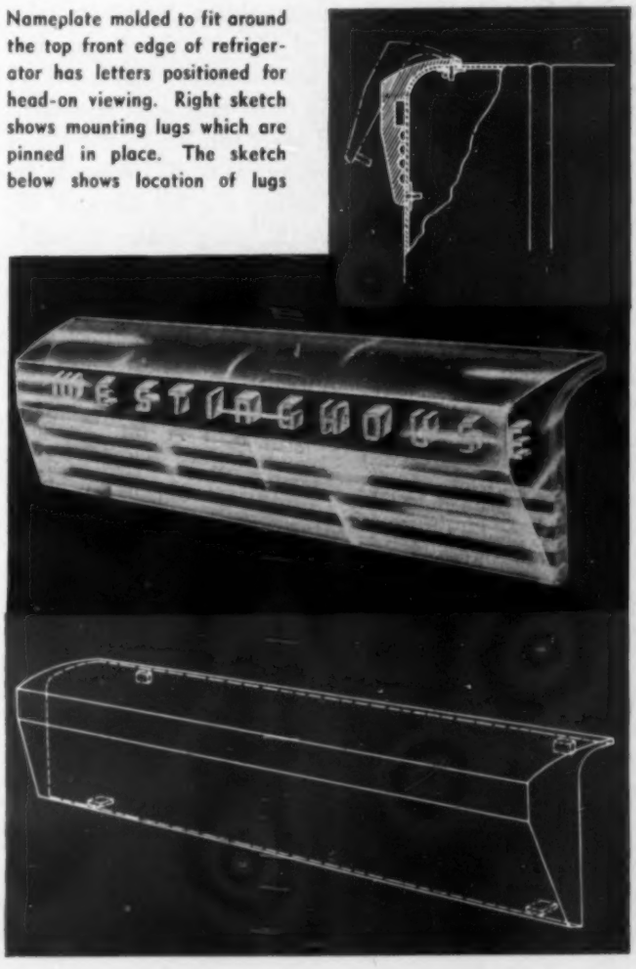
In the first attempt at three-dimension nameplate design, the artist is apt to specify too great a depth for the letters. This is not desirable for three reasons. First, it increases molding costs. Second, it causes certain characters of the alphabet (such as E, M, W, etc.) to become blurred and appear smudged when viewed from a distance. Third, the greater the specified depth of the letters the more difficult it is to spray small far corners evenly.

Bezel and method of mounting

Mounting a nameplate has been one of the most serious problems to the designer, especially if he is appearance-conscious. It must be remembered that a person looking at a finished mounted nameplate is always looking through the front and towards the back. After paint has been sprayed into the letters and designs incised in the rear, the eye will travel through the plastic piece and stop where the paint has formed a backdrop. All this greatly increases the difficulty of figuring out a method of mounting.

Unless some new method of mounting nameplates can be devised, a bezel, whether it be metal or opaque plastic, is the easiest and most attractive solution to the mounting problem. If the designer should feel that a nameplate is too simple in appearance, he can enhance the display by using an elaborately designed bezel. If for cost reasons the designer does not want to use a bezel, he must resort to protrusions or screws for mounting.

Although both of these methods are widely used, each has definite drawbacks from an appearance standpoint. It is quite a problem to design a protrusion that will be completely hidden. Whether it is colored or not, it will appear as a little tunnel or hollow shell. If protrusions are used in plain sight where color is added, the nameplate may have an unattractive, unfinished appearance. In using screws, plated or otherwise, the appearance of the nameplate is certainly not improved; rather, it is greatly reduced.



Nameplate molded to fit around the top front edge of refrigerator has letters positioned for head-on viewing. Right sketch shows mounting lugs which are pinned in place. The sketch below shows location of lugs



Organosol clowns are slush molded. Duck is formed by dipping plaster mold in plastisol. Coatings on all three toys are fused by heat and finished by hand painting with vinyl

Vinyl Organosol and

Thick dip coatings are replacing those produced by rubber latex, with outstanding new advantages

SINCE their introduction to the protective coating industry during World War II, vinyl dispersion resins have become important parts of the entire resin and plastics coating field. The versatility of these dispersions was first established in the cloth coating industry; millions of yards of cloth coated with vinyl dispersions are being produced today for upholstery for automobiles, furniture, etc. Now, through the media of these vinyl dispersion resins or, as they are specifically called, vinyl organosols or plastisols, the most chemical resistant, toughest, most elastic, and least soluble of the vinyl resins can be applied as coatings at 60 to 100% solids.

Since vinyl dispersions either use no solvents or, at most, inexpensive solvents, they make possible considerable savings for those convertors who evaporate expensive vinyl solvents without the benefit of a solvent recovery system; for those who must make multiple passes of the article they are coating, in order to build up sufficient thickness, vinyl dispersions offer a method by which coatings can be applied to a thickness of an ⅛ in. or greater in one application. The resulting coatings are resistant to organic and mineral acids (including HCl and aqua regia), to alkalis, to soap and washing, to greases, butter, cheese, oil, cosmetics, and to many other chemicals both wet and dry. They are clear, neutral, non-oxidizing, non-yellowing, non-heat reactive, non-toxic, odorless, and tasteless. They are insoluble in many solvents including alcohols, and hence are resistant to liquors and wines. They resist gasoline and petroleum products, have excellent resistance to water and can be made almost permanently flexible.

The problem of dispersing or suspending a synthetic resin in liquid media was originally solved abroad, using vinyl resins and liquid organic media. The materials were introduced into this country in 1942 as organosols and plastisols. These are not solution coating resins, but are dispersions in which very small resin particles are permanently suspended as small discrete particles in an organic solvent media, much as rubber latex is a suspension of Hevea rubber particles in water.

The organic dispersion media used for vinyls can be composed of 1) an organic solvent (with or without plasticizer) in which case the dispersion is called an organosol or 2) of a plasticizer (without any solvent) in which case the dispersion is called a plastisol. Actually, a plasticizer is nothing more or less than a high boiling organic solvent, so that a discussion of organosols will be equally applicable to plastisols, with limitations to be discussed later.

Organosols

The most important variable in organosol technology is the solvent used. Vinyl dispersion resins can be produced with a variety of pure solvents but mixtures of solvents are generally used. The individual solvents fall into two groups called dispersants and diluents. The first group, the dispersants, includes the ketones, esters, all the vinyl plasticizers, and those solvents capable of solvating or swelling vinyl resins. The second group, the diluents, includes all the aliphatic hydrocarbons, all the aromatic hydrocarbons (benzol, toluene, xylol, etc.), and some solvents containing an alcohol group. One or more of the dispersants and one or more of the diluents are usually used in an organosol. The dispersant and diluent proportions are critical and must be determined experimentally.

One Dip

A new front opens in the battle between vinyl and rubber. Through the use of the new vinyl organosol and plastisol dispersions, rubber-like coatings as thick as 3/32 in. or more can be produced in one dip. Multiple coating operations, coagulant tanks, and leaching processes common to rubber latex coating are eliminated.

Dispersions will coat wire, molds, or any dippable object with uniform, rubbery, elastic vinyl coatings.

Plastisol Dispersions

by JOSEPH M. PERRONE*
and EDWARD H. NEUWIRTH†



Plastisol finger cot and organosol gloves resemble rubber in appearance and elasticity, but are superior in color, resistance, and stability. Center glove has a cotton base

Organosols with plasticizers added can be made to form coatings varying from relatively stiff and tough to thick, rubbery, non-tacky, soft, elastic, and resilient. It is this versatility of vinyl organosols, in addition to their chemical and physical properties, which first interested the rubber latex field. It was soon realized that vinyl dispersions could be utilized to achieve the same end result as rubber latex, but could produce coatings far superior in resistance, color, stability, and ease and speed of application.

The extent to which vinyl organosols have and can replace rubber latex, both natural and synthetic, is shown by the varied uses to which they have already been applied. One prominent manufacturer of wire-formed articles for kitchen use, who previously had used dip-coated rubber latex to give the wire a soft and resilient surface coating, has converted completely to a dipping vinyl organosol dispersion to produce a uniform and superior product with a tremendous increase in production schedule. Recently, another manufacturer has introduced successfully a line of vinyl footwear, produced from a dipping vinyl organosol, which competes with rubber footwear. Interestingly enough, the same equipment is used, with some additions, which previously had been used on rubber latex production. Still another manufacturer, who produces rubber gloves from latex, has introduced a complete range of vinyl gloves, which are as "rubbery" as and much more chemical and water resistant than rubber gloves. A large manufacturer of rubber dolls and toys has worked out a new line produced from vinyl dispersion resins.

Speed of production with organosol coatings is illustrated by the fact that, in one case, 10% of the space formerly necessary for latex production now produces twice as many articles with one-half the personnel—and rejects are practically eliminated.

The changeover to vinyl organosol dispersions has not been confined to rubber latex dip coating. Vinyl dispersion coatings are found to be easily applicable to slush and flush molding and are here being used to replace rubber latex to achieve a product with superior resistance and greater molding detail.

Applying organosols

Vinyl organosol dispersions, as they are received by the ultimate user, can be specified to be ready for use or, as some prefer, thinner may be added to adjust to some convenient viscosity. The viscosity and the solids of organosols can be controlled by solvent selection, thereby eliminating the use of thickeners and their attendant difficulties.

When the correct viscosity and solids have been determined for a given coating application, the process becomes a relatively simple, one step operation. The article to be coated is immersed in the organosol, withdrawn, and the coating fused by heat. The film or coating thus obtained can be varied from a very thin film to one 3/16 in. or greater in thickness. The coating thickness is usually varied by controlling the viscosity or solids content of the dispersion or by the temperature of the article to be coated, which is sometimes preheated before dipping to increase pickup. Temperatures of preheat may vary from 125 to 375° F. Dipping cycles can be relatively fast, the entire operation, including submersion, swell time, and withdrawal, being of the order 90 to 180 seconds.

Fusion of coating

One of the advantages of organosol coatings is the ease and speed with which the dry vinyl coating is

Does It!

Vinyl dispersion coatings have properties, not available in other coating media, of permanent flexibility, good chemical and water resistance, low solubility and high toughness.

Coatings are quickly and easily applied. One manufacturer who converted from rubber latex to organosol coating reports twice as much production with half the personnel in 1/10 the plant area formerly needed.

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obtained. The fast fusion of vinyl organosols is accomplished by the use of heat; either hot-air convection or infra-red ovens can be used. Dip coated articles are simply subjected to a heating cycle of 5 to 10 minutes. During the heating cycle, the organosol fuses into a permanent continuous coating which cannot be redispersed.

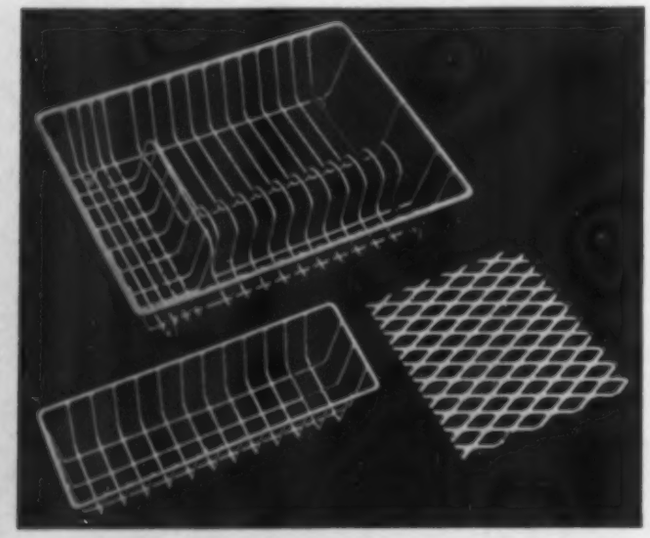
The temperature and time required for the fusion of vinyl organosols will vary depending on the object being coated. The usual procedure is first to release the solvents contained in the organosol at some comparatively low temperature between 140 and 250° F. and finally to fuse the film by momentarily increasing the temperature to 300 to 325° F. The coated article is then air-cooled or plunged into cold water.

The time for the entire vinyl organosol coating cycle, including preheating, (if necessary), dipping, and fusion, will depend on the mass of the object being coated. On objects like wire forms, the complete coating cycles are of the order of 15 min., while on heavier objects such as ceramic glove molds the cycle may require 30 min. or longer.

In addition to dipping processes, organosols may also be used in certain slush or flush moldings applications. Unfortunately, some difficulty is occasionally encountered because of recesses in the molds. During fusion, the organosol solvent retained in the recesses tends to cause bubbling and blistering. Accordingly, the use of organosols for slush or flush molding has been confined to open molds or molds that do not have recesses or inclosures which will trap solvent. On occasions, it is sometimes practical to use a hot liquid bath for final fusion of organosols which are coated on the inside of molds.

In slush or flush mold applications, vinyl dispersions have the ability to reproduce extremely fine details from molds. To illustrate: in a doll 1 in. in height, even the eyelashes and hair lines were faithfully reproduced!

Metal egg basket, dish rack, and section of expanded metal are dipped in colored organosol to obtain a soft and resilient coating. This coating is fused on metal by curing bake



Plastisols

Of the two vinyl dispersions under discussion, the organosols are more versatile than plastisols inasmuch as a wider range of rubbery and elastic coatings can be manufactured. Furthermore, the formulator or compounder of organosols can produce dispersion coatings with a greater latitude of viscosity and solids which makes organosols more readily adaptable to difficult coating applications. Nevertheless, for certain special applications, plastisols are equally as applicable and have certain distinct advantages. Since there is no solvent in plastisols, the material can be considered to be 100% solids.

Plastisols can be varied in viscosity from smooth and free flowing to a heavy paste-like material; like organosols, they can be dipped or slush or flush molded. However, it is in slush or flush molding that plastisols are the more versatile. Because there is no solvent which can be entrapped, the construction of the mold is of no serious concern and many intricate objects have been produced from plastisols.

The application of plastisols follows the same principles as described for organosols. However, due to the lack of solvent, the successful fusion of plastisols is much simpler. After dipping a mold into a plastisol, the fusion can be accomplished, as with organosols, by hot air or infra-red heat; in addition, the plastisol can be fused by the use of a suitable hot liquid bath. The dipped mold is merely submerged in a suitable liquid bath at between 325 and 350° F. Thus, the plastisol is in intimate contact with the heat and quickly fuses into a rubbery elastic film.

The same technology of a hot bath is applicable to slush or flush moldings, only in this case the mold is in intimate contact with the liquid and fusion of the plastisol occurs by transmitted heat.

After fusion, the mold used in either plastisol or organosol applications may be cooled by placing the mold, with the vinyl dispersion coating still on it, into cold water. After the mold is cooled, the vinyl coating can be easily removed, without waste.

Applications of organosols and plastisols, other than those already mentioned, will depend on the ingenuity of the manufacturers, particularly those who now use latices of various types and who desire to increase production and quality of finished goods. However, the potential user of vinyl dispersions should be certain that he obtains reliable advice on the subject. The technique of manufacturing, application, and formulation of vinyl dispersions for the elastomeric industry is a relatively new and complicated field in which there are many pitfalls for the uninitiated. It is entirely possible that a commercially feasible idea involving vinyl dispersions may be discarded as impractical when the vinyl dispersion and not the idea is at fault.

Plasticizers

A balance between supply and demand seems about to be established. Will the consumption of plasticizers by industries other than plastics upset this balance?

(Concluded from last month)

A RULE of thumb in plastics is that every 2 lb. of polyvinyl chloride and copolymers used in elastomeric formulations require 1 lb. of plasticizer for the finished product. Thus, the estimated 140,000,000 lb. of vinyl chloride resins used in 1948 would require near 70,000,000 lb. of plasticizers.

No record of 1948 plasticizer production will be available until late in 1949. Estimators state that the total poundage was probably in the neighborhood of 170,000,000 pounds. However, a great portion of that production is not suitable for vinyls, and other uses for plasticizers have developed a highly competitive market for those compatible with vinyl.

Until late in 1948 there was a pronounced shortage of dioctyl phthalate (DOP), tricresyl phosphate (TCP), and some of the fatty acid derived plasticizers which are most widely used in vinyls.

A sudden "plenty" of the basic ingredients used in plasticizer manufacture (phthalic anhydride, cresol, and castor, palm and other vegetable oils), now gives the customers the opportunity to be "choosey." Since vinyl compounding depends so much on blending, it can be taken for granted that the consumption and marketing of plasticizers is going to take on some new and interesting aspects in the next few years.

Naphthalene has many uses

In order to understand this sudden "catching up" of a commodity that was expected to be short for several years, it is necessary to review the supply situation in raw materials for several years back. Naphthalene is the beginning point since it is the chief chemical used in the manufacture of phthalic anhydride from which the phthalate plasticizers are derived. Naphthalene, a coal tar product, has been in heavy demand since the beginning of the war. Crude production increased from a prewar figure of 100,000,000 lb. annually to around 300,000,000 lb. in 1948. In addition, almost 40,000,000 lb. were imported in that year.

Current chief uses of naphthalene break down about as follows:

Phthalic anhydride	200,000,000 lb.
Amount of crude used in refined naphthalene going to following end uses:	
Household use	30,000,000 "
Beta naphthol for dyes	50,000,000 "
Sulphonated and special intermediates	20,000,000 "
Chlorinated and hydrogenated	10,000,000 "
Other uses	25,000,000 "
Inventory	5,000,000 "
Total	340,000,000 lb.

There is every indication that supply has caught up to current demand. How long that situation will last depends largely upon the rate of expansion and upon sales in the paint, plasticizer, and dyestuff industries. In addition, it is estimated by some chemists that the 750,000,000 gal. of coal tar produced from coke ovens in this country could be processed to produce at least 500,000,000 lb. of naphthalene instead of the 300,000,000 lb. that came forth last year, but there is little likelihood that such production heights will be reached unless the price structure is altered.

This situation, of course, leads to an easement of the phthalic anhydride shortage. Production of this chemical rose to nearly 160,000,000 lb. in 1948, compared to 100,000,000 lb. in 1946, and 125,000,000 lb. in the former peak year of 1945. The factor for conversion of naphthalene to phthalic anhydride is about 78 percent.

Perhaps the most important contributor to this shower of plasticizer plenty was the paint industry, since phthalic anhydride is a constituent of alkyd surface coatings which are widely used on automobiles, refrigerators, washers, ironers, etc., as well as for house paint. When the demand for many of these durable goods items dropped, there was less need for alkyd paint and thus more phthalic became

available for plasticizers. There was also less demand for other phthalate plasticizers such as diethyl and dimethyl used in insectifuges and as plasticizers for the cellulosics. Use of dibutyl phthalate dropped off because there was no war-time need for smokeless powder in which it was a necessary ingredient, and the chemical became less widely used in vinyl plasticizers because of its high volatility.

Furthermore, two companies came in with improved methods of manufacture of phthalic anhydride. American Cyanamid adopted a system with less waste in production and thus increased their output. The Barrett Div. of Allied Chemical started production in a new plant at Ironton, Pa., with a reported 30,000,000 lb. annual capacity but even more significantly employed a new catalyst which speeds up production. In fact, nearly every company in the business has expanded capacity. In addition, about 1,000,000 lb. were imported last year, and there are 5,000,000 lb. capacity plants in Italy and France, two plants in Belgium, two in England, and another about ready in Denmark. All these developments indicate that there should be little danger of a phthalic shortage in the near future unless war should intervene.

Table I.—Total Plasticizers Production[a] in 1000 Pounds

	1945	1946	1947
Plasticizers, cyclic			
Phosphoric acid esters:			
Tricresyl phosphate	13,500	10,300	12,000
Phthalic anhydride esters:			
Dibutyl phthalate	46,000	14,000	22,000
Dicapryl phthalate	....	1,000	....
Dicyclohexyl phthalate	....	2,000	2,500
Diethyl phthalate	9,700	13,000	8,000
Dimethyl phthalate[b]	18,800	5,500	1,800
All other[c]	24,500	23,500	40,200
All other cyclic plasticizers[d]	26,400	15,500	17,100
TOTAL	138,900	74,800	103,600
Plasticizers, acyclic			
Azelaic acid esters	37	34	....
Lauric acid esters	1,000	367	1,270
Citric acid esters	539	....	....
Oleic acid esters	3,148	4,379	2,588
Phosphoric acid esters[e]	2,160	1,381	3,144
Sebasic acid esters:			
Dibutyl sebacate	5,853	2,335	....
Ricinoleic acid esters	....	834	....
Stearic acid esters	3,000	5,881	9,000
All other acyclic plasticizers[f]	15,139	13,344	28,627
TOTAL	30,876	31,555	44,629
TOTAL—ALL PLASTICIZERS	169,776	105,355	148,229

Estimated Consumption of Above Plasticizers for Vinyl Resins Only in 1000 Pounds

	1946	1947	1948
Tricresyl phosphate	9,000	10,000	12,000
Phthalates (for vinyl)	25,000	36,000	42,000
All other	8,000	12,000	16,000
TOTAL	42,000	58,000	70,000

[a] Figures based on statistics from "Synthetic Organic Chemicals, U. S. Production and Sales" by United States Tariff Commission.
[b] Includes dimethyl phthalate for use as an insect repellent.
[c] Includes phthalic anhydride esters of phenols, substituted cyclohexanols, fatty alcohols, monohydric alcohols, cellosolves, carbitols, and other dihydric alcohols and phthalyl glycolates.
[d] Includes amylnaphthalenes, toluenesulfonamides, synthetic camphor, methylphenol, polymerized styrene, coumarone-indene, abietic acid and benzcylbenzoic acid esters, and fatty acid esters of cyclic alcohols.
[e] Includes phosphoric acid esters of monohydric alcohols and cellosolves.
[f] Includes esters of acids such as adipic, citric, pelargonic, propionic, ricinoleic, sebacic (for 1947), tartaric, acetylated acids, and others reacted with monohydric alcohols, glycols, glycerol, cellosolves, and other polyhydric alcohols. Plasticizers which are not esters include polyglycols and nitrogen-containing compounds.

The principal plasticizer to benefit from this situation is DOP, the other main ingredient of which is octyl alcohol. The latter chemical has been even more scarce than phthalic anhydride, but that situation, too, has been remedied. Not only has Carbide and Carbon, the sole producer up until last Fall, about doubled its capacity, but the Enjay Co., chemical marketing affiliate of Esso Standard Oil Co., recently started delivery of iso-octyl alcohol, derived from petroleum, and several companies are now, or soon will be, producing di-iso-octyl-phthalate using the Enjay product. Indoil Chemical Co., an associate of Standard Oil of Indiana, announced that it would start producing nonyl alcohol in the latter half of 1949, but has recently cancelled its project.

Total production capacity of the two plants is not known, although industry experts estimate that the Carbide and Carbon production before planned expansion was somewhere near 30,000,000 pounds. Esso has been reported as planning a substantial expansion in production but no figures have been released.

If these two companies realize their plans in 1949, there seems little need to worry over any continued dioctyl phthalate or kindred plasticizer shortage. Since 100 lb. of DOP requires about 70 lb. of octyl alcohol, there should be enough alcohol for perhaps 70,000,000 lb. of DOP which, together with other type plasticizers and extenders, should be more than sufficient to plasticize the expected vinyl chloride and copolymer resin production of somewhere near 175,000,000 lb. in 1949. In addition, there should be enough alcohol left over to serve newly developed uses in such fields as wetting agents, emulsifiers, anti-foam agents, drying oils, detergents, sizing agents, and particularly as an agent to maintain viscosity of greases used in airplanes at high altitudes. The question now is how long it will be before the new ones begin taking enough octyl or iso-octyl to interfere with its availability for plastics.

New companies in the field

The apparent availability of the ingredients used in DOP and the great demand for DOP as an all-around plasticizer for vinyls has attracted the interest of several chemical companies who are now

(*Please turn to page* 146)

Polystyrene Dispenser Boosts Sales

by ROBERT A. COOPER*





Left above: As the box of cleanser slides into container, inside spout from pouring holes punctures box and seals opening on all sides. Left: Blended front overhang and Scotch bag piper soften angular lines

A SALES-STIMULATING dispenser for Scotch Cleanser, a household scouring powder marketed in the West by the Los Angeles Soap Co., Los Angeles, Calif., has proved a natural for plastics. In fact, when the company decided to market a premium dispenser, plastic was the only material which met its requirements: inexpensive to avoid disproportionate price contrast with the product; sufficiently decorative to furnish an incentive to buy; and practical to insure customer satisfaction.

Analysis of the problem showed that an injection molded polystyrene container offered the most economical and practical solution. While tooling costs would be high, the molding technique would permit a box shape to be formed in one operation. The brilliant colors and inherent luster of polystyrene would make an attractive container without finishing, buffing, plating, or painting.

Experiments were made with hand-made models to determine the best means of placing the cardboard powder container inside the dispenser. It was finally decided to hinge the back end of the dispenser at the bottom, as shown in one of the photographs. An external profile design was obtained from Leonard Arthur Wheeler, Los Angeles package engineer. He softened the angular shape with a blended front overhang, in which are situated the pouring outlet holes, and added two broad panels on the side surfaces.

The Engineering Dept., Plastic Die and Tool Corp., Div. of Wilcox Plastics, Inc., Los Angeles, together with a soap company official, developed a box-opening device consisting of a tubular spout which extends straight back inside the dispenser from the pouring holes and completely surrounds and encloses them. When the box is inserted in the dispenser, the spout comes in contact with the perforated half-circle on the box and pushes it against the inside top of the box.

Two two-cavity molds are used to produce the red or ivory colored Styron or Lustron dispensers —one mold for the body and one for the back. The opening device is molded integrally with the body. The back is hinged by drilling holes into bosses provided and driving in pins from the outside.

The containers are merchandised through regular retail outlets, only in combination with the cleanser — two boxes of cleanser and a dispenser for 39¢. They are priced to the stores at a figure that enables them to make a profit on their sale. Manufacturing, handling, and amortization charges are such that the soap company breaks even on the premium; its profit comes from increased cleanser sales.

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PLASTICS PRODUCTS

The ancient oriental game of Mah Jong, a distant relation of the modern game of rummy, is played with tiles, chips, and dice, all of which were originally carved of ivory. In modern sets, plastics are often used. Mayburn Mfg. Co., Chicago, Ill., which makes Mah Jong sets for export to the orient and for players in the United States, uses tiles, chips, and dice molded of Plaskon urea formaldehyde

Frequent sandpaper replacement is not necessary with Speed-Grits Sander, which is loaded with a roll of sandpaper so that a new length can be pulled into place quickly when the length in use wears out. The sander is available in two sizes, 7 by 2 in. and 5 by 1⅜ in. The Behr-Manning Corp., Troy, N. Y., makes the sander and Waterbury Companies, Inc., Waterbury 90, Conn. molds the housing of either Bakelite phenolic or Beetle urea formaldehyde



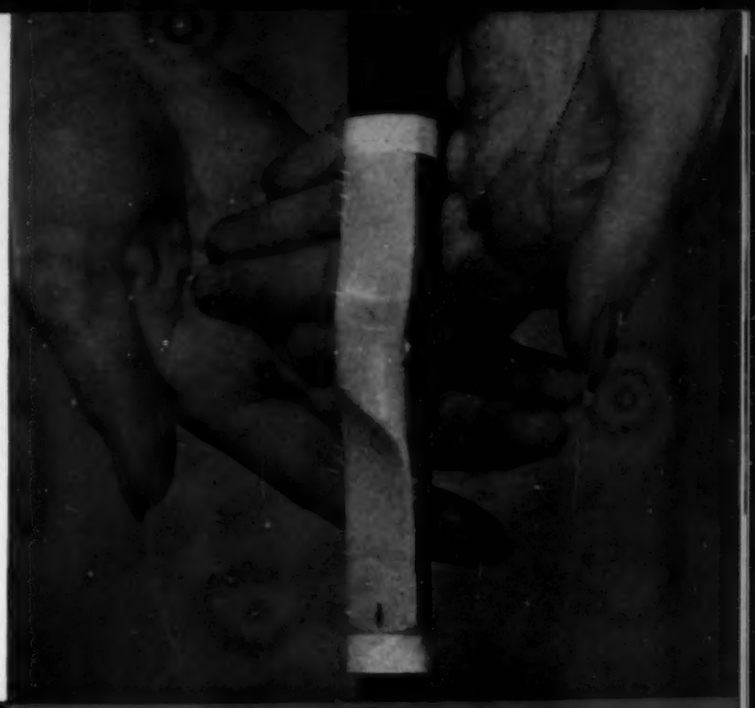


For its new standard broadcast and short-wave model radio, Radio Corp. of America wanted a cabinet design which could easily be adapted for use on other types of radios. Designer Henry Dreyfuss, 501 Madison Ave., New York, N. Y., solved the problem with a phenolic cabinet with a combined speaker grille and dial molded of acrylic. Drum type tuning controls result in a flush front surface. Cabinet is molded by Molded Products Corp., 4533 W. Harrison St., Chicago 24, Ill.; grille by A. L. Hyde, Main St., Grenloch, N. J.



Trays or tables which are used to serve food to airline passengers must be light in weight, attractive in appearance, and easy to keep clean. A new folding table which meets all these requirements is being fabricated of pastel-colored translucent Lucite. The tables are 11½ by 21¾ in. and are fabricated from 3/16-in. thick acrylic sheet. Aluminum legs fit into the arms of airline seats when the table is in use. Made by Schoen-Burn Co., San Francisco, Calif.

When the Grip Finder is attached to a putter, there is only one way to grip the putter — and that is the right way. Pro Frank Strazza, Round Hill, Greenwich, Conn., invented the device for his own use while practicing. It is molded of Tenite II cellulose acetate butyrate and sold in golf clubhouses and sporting goods stores. It is attached to the shaft of a putter with adhesive tape with the top end of the Grip Finder between 3½ and 4½ in. below the top of the putter. The arrow on the bottom of the finder is aligned with the center of the putter shaft. The shape of the Grip Finder forces the golfer to grip the putter the same way every time — with both thumbs lined up. Manufactured of ivory or brown Tenite II by Sterling Injection Molding, Inc., 277 Military Rd., Buffalo 7, N. Y.







Four different plastic materials are used in the Gamette, a cribbage board which contains a deck of playing cards, a removable tray of chips, four dice, and the pegs for the cribbage board. The box is injection molded of Styron polystyrene, and the removable tray for the chips is Ethocel ethyl cellulose. Plaskon urea is used for the chips and Catalin cast phenolic for the dice. Made by Associated Plastic Companies, Inc., 414 Hines St., Midland, Mich.



Decorative, water-resistant containers for flower pots are made of rigid Vinylite sheet by Mary Donlan Ver Mett, 604 S. Adelaide, Fenton, Mich. The potted plant is kept in the plastic container, thus eliminating the need for paper trimming or underliners. Water is poured into the container and the plant gets the moisture it needs by absorption. The containers are produced in red, white, dark blue, and green in various sizes to fit different sized pots



Woven straw has long been popular for summer shoes, purses, and other accessories in the female wardrobe. But the color possibilities of straw are limited, the material is hard and "scratchy," and the straw cracks easily. All these disadvantages are eliminated by a new plastic cloth made by Monad Products, Inc., 453½ East Exchange St., Akron 4, Ohio. The cloth is woven of flat polyethylene "straws" which are made by folding many layers of thin film and crimping them to prevent unfolding. This method makes possible a softer cloth than can be made by weaving round monofilaments. The cloth can be sewed easily and can be lasted by heat shrinking. The handbag and shoes shown at left are made with the colorful new cloth





Colorful bowls and plates molded of Lustrex polystyrene become rich looking decorative pieces when they are pattern plated with intricate designs executed in gold or sterling silver. The effect is similar to that achieved by silver or gold deposit on glass, but the plastic version is lighter in weight, less fragile, and has more attractive background colors. G.M.C. Process Corp., 46 Great Jones St., New York, makes the bowls. The range of patterns is almost unlimited



A baby bottle warmer and a vaporizer are combined in one attractive unit which has polystyrene, phenolic, and acetate parts. Polystyrene is used for base and housing. Inner cups and cap, which must resist boiling water, are molded of Bakelite phenolic. The front of the unit has a metal plaque with a baby's face behind an acetate window. Made by Spartan Co., 1163 Merchandise Mart, Chicago, 54

PLASTICS PRODUCTS



Tools for sculpturing in clay have long been made of wood. Recently introduced Lustrex polystyrene tools are about one third the cost of wooden ones, stronger, smoother, and more uniform. Twelve different tools are molded by Plastiline Corp., 2 Intervale St., White Plains, N. Y., for Plastic Artisans Inc., 70 Westchester Ave., White Plains, and distributed by Sculpture House, 304 West 42 St., New York 18

Mothers who have only two hands and often wish they had three will appreciate the convenience of the Baby Time dispenser for baby oil, boric acid, etc. It only takes one hand to swing the top cover aside and press the dish-like inner cover. The pressure causes a pumping action which ejects enough liquid to saturate a small piece of cotton. The cap, the top dish, and the cylinder and piston of the pump are molded of rigid Vinylite by Calmar Co., 7412 S. Bdwy., Los Angeles, Calif., for Menda Co., 275 N. Hill Ave., Pasadena





Hypodermic syringes and needles can be sterilized and kept sterile in special cases molded of nylon. The cases have caps designed to fit snugly but to permit circulation of steam while in the sterilizer. After the cases are removed from the sterilizer, the caps can be pressed onto a tapered seat to seal the unit and keep the contents sterile. Molded by Reinhold-Geiger Plastics, 8763 Crocker St., Los Angeles 3, Calif., for Menda Co., 275 N. Hill Ave., Pasadena, Calif.

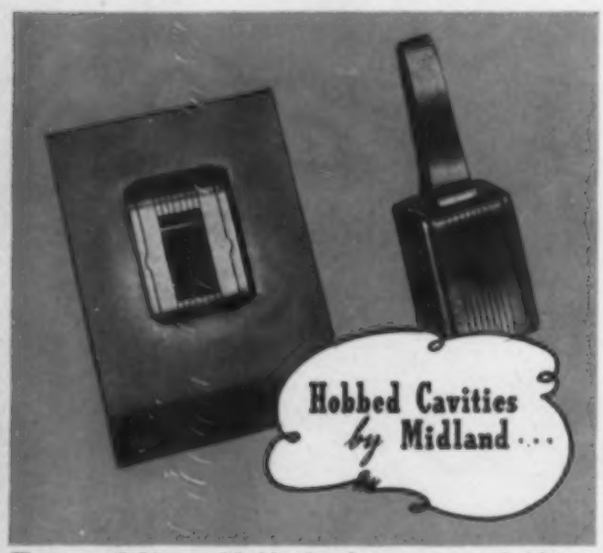


The sales of sun glasses can be increased by keeping them on constant display in transparent cases molded of Lumarith cellulose acetate. The cases are offered at no extra cost with the popular priced sun glasses made by Columbia Protektosite Co., Inc., 631 Central Ave., Carlstadt, N. J. Light in weight, the cases are rigid enough to protect the sun glasses from breakage or scratches. The company also uses acetate to mold the sun glass frames

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The arm of this towel holder bracket measures only 3/4" at the base and tapers to only 9/16" at the tip. It is but 13/16" wide—yet this Midland Hob is sunk a total of 3-1/8" into die steel to form a perfect hobbed cavity. It is capable of repeated use in making multiple cavity molds at exceptionally low cost.

Get that desirable output *faster* and more *economically* from multiple cavity molds using hobbed cavities by Midland. The Midland method of producing hobbed cavities guarantees uniformity, superfine finish and serviceability—*at only a fraction of the time and cost of cavity duplication by machining methods.* Intricate detail, unusual contour, extreme depth are handled perfectly at Midland as the cavity at left will illustrate.

If you're planning production of multiple cavity molds for injection or compression molding get into production *faster*—make your production *purr-r-r*—by bringing your problems to Midland. Send for a copy of the book "Shaping Tomorrow Today." It describes the Midland organization, experience and facilities. Do it today!

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D&E

Variables in High Frequency Preheating

Speed of preheating, molding pressure, and cure time are all affected by variables which must be recognized by the molder

by A. J. GUZZETTI†

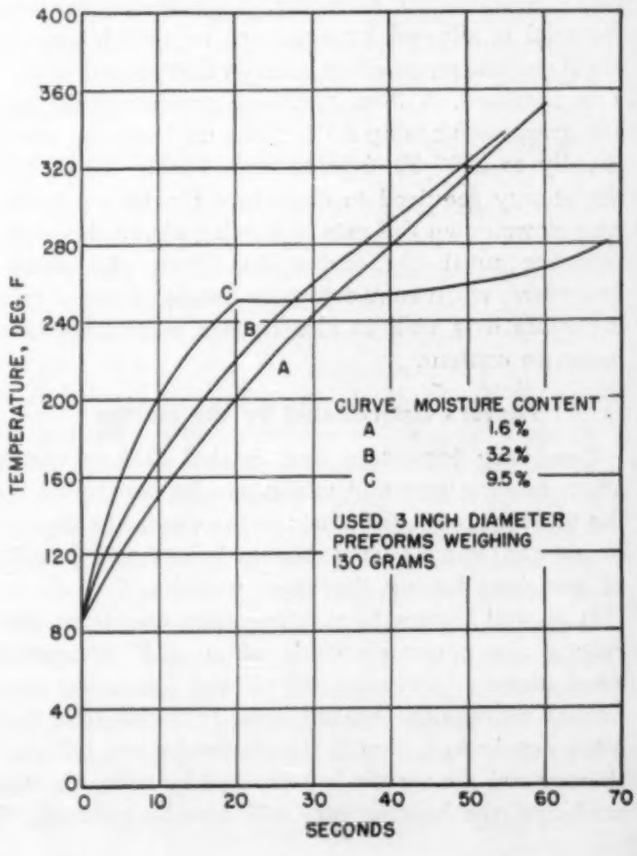
HIGH-frequency dielectric preheating of thermosetting molding materials is now a well established procedure in the molding industry. It offers a number of advantages to the molder when applied with an understanding of the techniques required.

At present many molding jobs using H. F. preheating are being carried out with H. F. generators operating at capacity. Such a condition limits the speed with which preforms can be preheated and, therefore, also limits the pressure reduction obtained in molding. Furthermore, H. F. preheating has reduced cure times so effectively in some jobs that over-all molding cycles are now shorter than the preheating time, or the sequence of molding operations is such that the preheating cycle does not entirely overlap the molding cycle; in such cases the H. F. preheating time determines the over-all molding time. It is the actual preform temperature and the allowable preheating and transfer time which determine the reductions in cure, in mold closing time, and in pressure which are obtainable by preheating of preforms as compared to standard molding procedures. For these reasons, minor variations in heating rate, caused by the use of different molding materials, or by changes in preheating technique, are being studied.

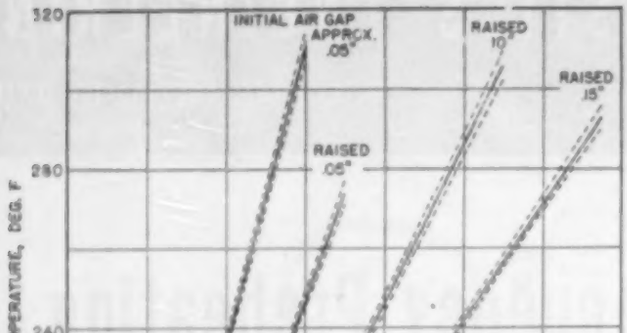
Composition affects heating rate

There are some variables affecting the heating rate of a thermosetting material which the molder can do nothing about when using an H.F. generator of a definite capacity. For example, the composition of the molding material itself has a tremendous effect on heating rate. The separate ingredients of a molding material are known[1] to heat up at variable rates in an electrostatic field of constant frequency and intensity. Their respective heating rates depend on their specific heats and loss factors; the uniformity of preform heating depends upon thermal conduction between the various components. The general order in which some common fillers determine the comparative heating rates of several commercial phenolic molding materials may be ob-

1 — Effect of moisture content on heating rate of phenolic molding material performs using high frequency



*Reg. U. S. Patent Office.
†Development Labs., Bakelite Corp.
1 "Progress in Heatronic Molding," by V. E. Meharg and A. P. Mazzuochelli, MODERN PLASTICS 21, 108 (June 1944).



2—Effect of raising top electrode on temperature of high frequency preheated preforms of equal height and weight

served in Table I. Asbestos absorbs H.F. energy the fastest, followed in order by woodflour, cotton all resin (no filler), and mica.

The moisture content of phenolic molding material, as it affects the loss factor[1], also changes the heating rate when using a constant H.F. power input, although this effect is not great in the normal range encountered. However, if a phenolic molding material is allowed by exposure to absorb considerable moisture, an effect such as that shown in Fig. 1 is obtained. A 3-in. diameter preform weighing 130 grams containing 9.5% moisture heats up more rapidly to 250° F. than one containing 3.2%, but the energy required to evaporate the excess moisture slows down the rate of heating above this temperature until the water has been eliminated. Therefore, when comparing the heating rates of two materials it is well to also have a record of their moisture content.

Factors controllable by the molder

Two very important and related factors which affect heating rate and which can be controlled by the molder are a) variations in the electrode spacing or air gap, and b) variations in height and density of preforms having the same weights.

It is well known to molding shop operators that raising the upper electrode of an H.F. generator (and thereby increasing the air gap above the preforms) reduces the heating rate. It is also true, but often overlooked, that if the electrodes are left stationary and the air gap is increased by using shorter preforms, the heating rate will also be reduced. If

Table I.—Effect of Filler on Heating Rate[a] of Phenolic Molding Material[b]

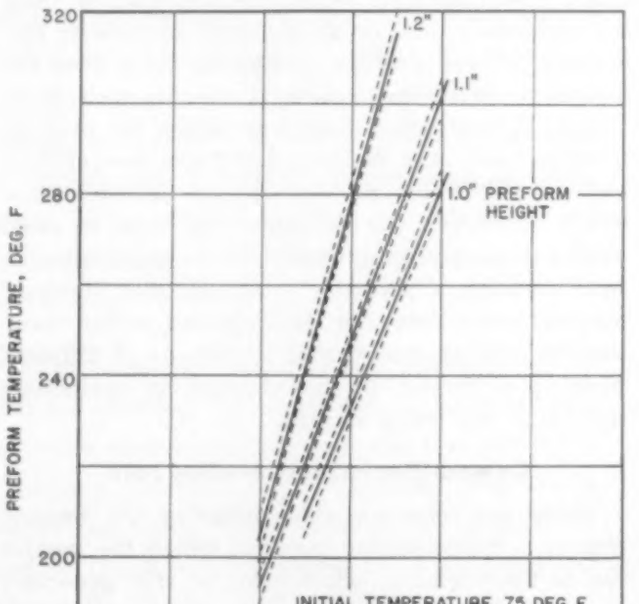
Material	*Filler*	*Seconds to reach 320° F.*	*Rating*
BM-261	Asbestos	36	100
BM-3200	Woodflour	51	70.7
XM-11990	Cotton	56	64.5
XM-9131	None	63	57.1
BM-262	Mica	78	46.1

[a] Constant power input at 30 megacycles.
[b] Preforms of same volume and dimensions.

the reduction in preform height is accidental, caused by the preform press operator having changed the upper die adjustment since the last lot of preforms was made for the same job, the difference in heating rate may result in rejected moldings.

The height of preforms is also an important factor when the relative rates of preheating of different molding materials are to be compared. The preform machine operator is concerned only with obtaining strong preforms of correct weight. Neither he nor the molding press operator has any reason to be worried over preform thickness so long as weight is correct and strength is satisfactory. It is easy, therefore, to see how preforms of varying height and density can be made from different molding materials, from different batches of the same material

3—Effect of preform height on temperature of high frequency preheated preforms. Upper electrode was fixed at approximately 0.05 in. above the tallest preform



or for that matter, from the same batch of molding material preformed at different times. Such variations in height—and they need not be great—can result in erroneous conclusions regarding a change in the rate of preheating.

The differences in heating rate produced when the air gap above the preforms is changed by lowering or raising the top electrodes is of interest. Measurements made under laboratory conditions, with a phenolic general-purpose material, showed that each 0.05 in. increase in air gap above preforms of slightly over 1 in. in height resulted in a 15 to 20% decrease in preform temperature for the same preheat time. The results are shown in Fig. 2.

When the electrode spacing was held constant but the preform height and density were varied by changing preforming pressure, significant differences in heating rate were also observed. Under the conditions of test, the taller preforms were raised to a temperature as much as 20% higher in the same time, as shown in Fig. 3.

When the top electrode was allowed to rest on the preforms and preform height and density was varied by changing preforming pressure, significant differences in heating rate were again observed, but in the reverse direction. Under these conditions, the shorter preforms were heated to as much as a 20% higher temperature in the same time, as shown in Fig. 4.

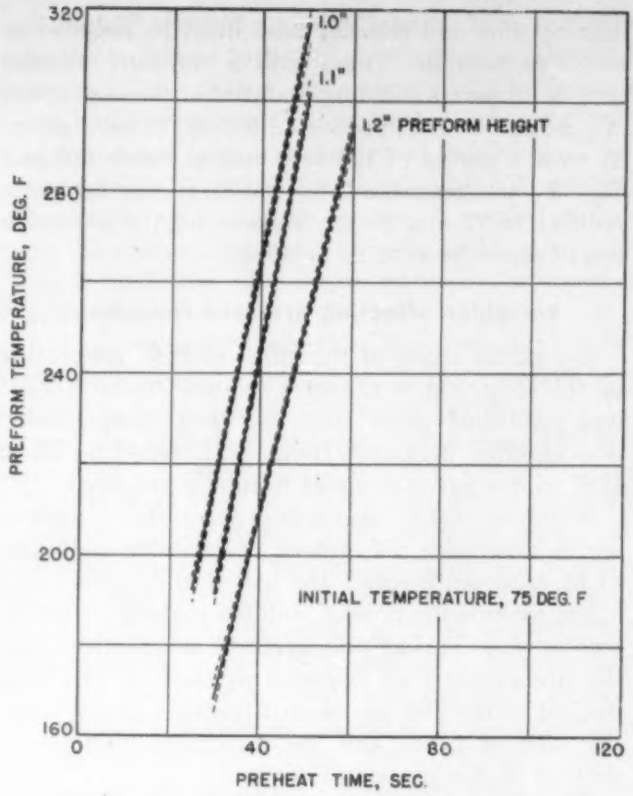
The foregoing results are in qualitative agreement with theory and are only an example of the type of behavior which may be expected in the field where using phenolic woodflour filled molding materials, and when the preheater is properly tuned and the variations are not sufficient to de-tune the circuit. However, the data given should not be applied quantitatively to predict what will happen under different conditions of charge weight, preform diameter, H.F. generator characteristics, etc. If changes are made which cause de-tuning, the results are not at all predictable.

In determining the data for Figs. 2, 3, and 4,

Table II.—Total Available Transfer Times for Typical Phenolic Molding Material Preforms[a] H.F. Preheated to 300° F. in 60 to 75 Seconds.

Number	*Description and class*	*Transfer time, seconds*
BM-14316	Gen. purpose—average curing	40
BM-3200	Gen. purpose—average curing	35
BM-2498	Gen. purpose—fast curing	30
BM-15140	Gen. purpose—fast curing	20
BM-13080	Odorless—average curing	35
BM-3510	Fabric-filled impact—average curing	35
BM-261	Asbestos-filled—heat resistant—fast curing	20
BM-16981	Mica-filled electrical—average curing	30

[a] Preforms 1½ in. diam., 37 grams weight. Time will also vary with size of preforms.



4—Effect of preform height on temperature of high frequency preheated preforms. Upper electrode was resting on preforms

eight preforms, 1 in. in diameter in four stacks of two each, were preheated at a time. All were approximately constant in weight, variations in height and density being obtained by preforming at 4000, 12,000, and 20,000 p.s.i. to give average heights of 0.61, 0.55, and 0.51 in. respectively. The dotted lines on each side of the solid lines show the precision of the laboratory measurements.

Effect of handling time

A fast-curing molding material will have to be preheated and generally handled much more quickly than a slow-curing material in order to avoid precuring and consequent loss of flow before molding. The straight-line relationship between preform temperature and the log of the available time for transferring the heated preform to the mold has already been pointed out in a previous article[1]. The slope of this line becomes steeper for materials of increasing heat sensitivity and curing rate. Table II gives a the total available transfer times for a group of commercial materials of different classes and curing rates whose preforms were H.F. preheated to 300° F. in 60 to 75 seconds. Preforms allowed to stand longer than this time may precure and require higher than normal pressures to mold. If the preforms are preheated to molding temperature at a slower rate, the transfer time will then naturally have to be reduced.

If very high preform temperatures are used, both

heating time and transfer time must be reduced as much as possible. Thus, with a constant transfer time of 10 sec., a molding material of average speed of cure can be H.F. preheated to 300° F. satisfactorily over a period of 120 sec.; but to reach 320 and 345° F. the maximum allowable preheating time reduces to 77 and 20 sec. respectively, if excessive loss of plasticity is to be avoided[1].

Variables affecting pressure reduction

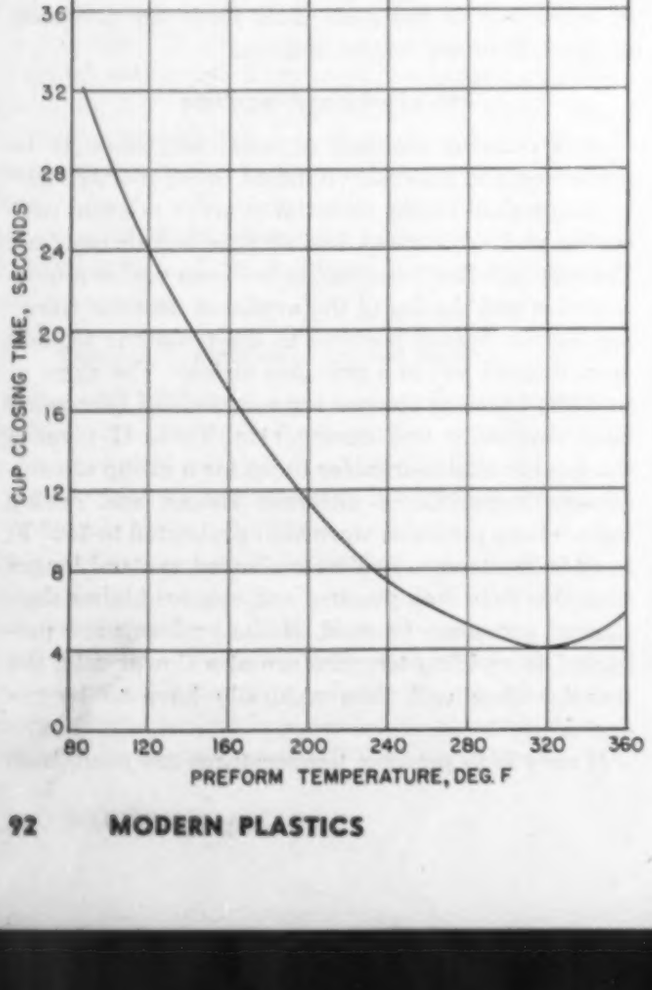
The initial study of the effect of H.F. preheating on the reduction in pressure required to fill a mold was published some time ago[2] and demonstrated that molding pressures could be lowered by 30 to 40% as compared to those normally required.

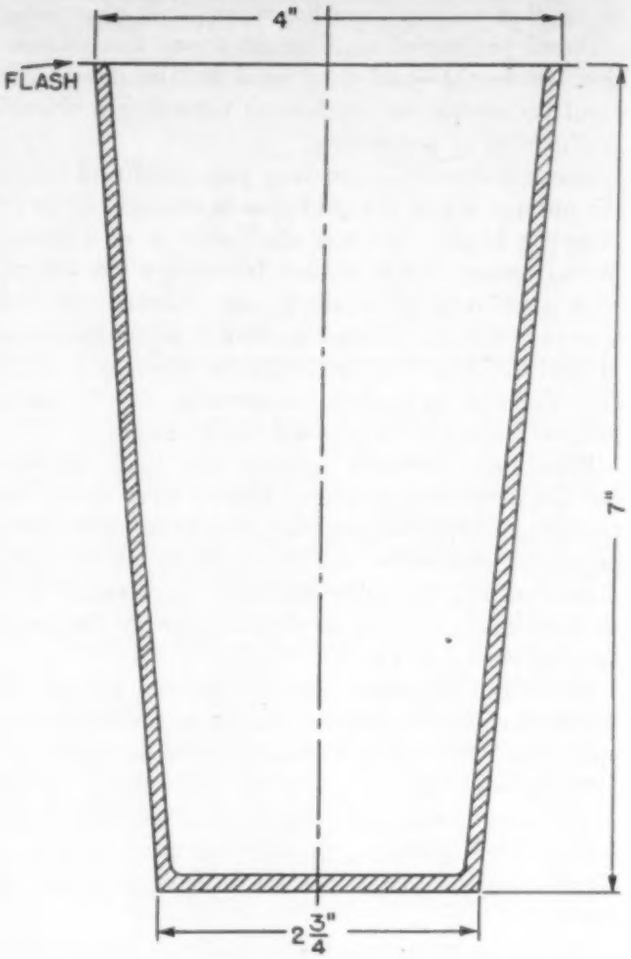
However, there are many interrelated factors which determine the extent of pressure reduction to be expected through the use of H.F. preheating. These include the type of molding material, whether fast or slow curing; the preform temperature and the preheating time required to reach it; the time needed to transfer the heated preform to the mold; the type of mold; and the dimensional tolerances desired in the particular piece.

The effect of preform temperature on mold closing time and on reduction in molding pressure is related to the over-all stability of the material at that temperature. This makes the effect of temperature dependent on the speed of closing of the press, on type of mold, and on the curing rate of the material. These complications make it necessary to determine the optimum temperature experimentally for each particular job. Nevertheless, the results of a few experiments will give an idea of the temperature range for a given combination of variables.

[2] "Heatronic Molding," by V. E. Meharg, MODERN PLASTICS 20, 87 (March 1943).

5 — Effect of high frequency preheated preform temperature on ASTM cup closing time at 2900-lb. total mold load





6 — Cross-section of shaker cup on which minimum load-to-fill measurements were made

Figure 5 shows the effect of preform temperature on ASTM cup closing time for a soft flow, average curing, general-purpose phenolic material (BM-3200) using a fast-acting press having a closing time without material of 2 seconds. In this test two 1½-in. preforms were preheated for a maximum of 18 sec. and were transferred to the mold in another 10 seconds. The total mold load (total "pressure" exerted by the press on the mold) was 2900 lb., the lowest which would fill the cup with unpreheated material. It will be noted that a preform temperature of about 320° F. gave the minimum closing time under these conditions.

In another experiment, the minimum load (i.e., lowest total "pressure" required) to fill a large shaker cup (Fig. 6) was determined as a function

of preform temperature for a much faster curing phenolic material (BM-15140). This mold was mounted in a self-contained relatively slow-acting press. Its closing time, empty, could be controlled somewhat but also depended on the pressure used. When set for "slow action," this closing time without material varied from 15 sec. at 60 tons to 30 sec. at 20 tons; for "fast action" it ranged from 12 sec. at 40 tons to 18 sec. at 20 tons. The data obtained are presented graphically in Fig. 7. In making these tests the preheat time was maintained at 40 sec. and transfer time at 4 sec.; the preform temperature was varied by adjusting the air gap. Curves A and B represent the change in minimum load to fill with preform temperature, for stiff and medium-soft material, with the press closing under "slow action." The load required decreased rapidly at first, then passed through a minimum at around 190 to 200° F., and thereafter increased continuously as preform temperature was raised.

Curves C and D were obtained with the press closing under "fast action." The faster press action resulted in a further reduction in the load required and a shift of the minimum to higher temperatures. Thus, speeding the press action not only made it possible to take fuller advantage of the softness imparted to the preforms by H.F. preheating to any particular temperature, but also increased the temperature to which the preforms could be heated before the acceleration of the thermosetting reaction counter-balanced the softening effect of higher temperature. The greatest reductions in pressure required to fill out the cup under these conditions were approximately 45 and 50% for the stiff and medium-soft materials respectively.

Further studies of the effect of H.F. preheating on the reduction in molding pressure to fill several different molds were also made. Using the same ASTM cup discussed earlier, the following materials gave the indicated pressure reductions, under comparable conditions, over use of cold material:

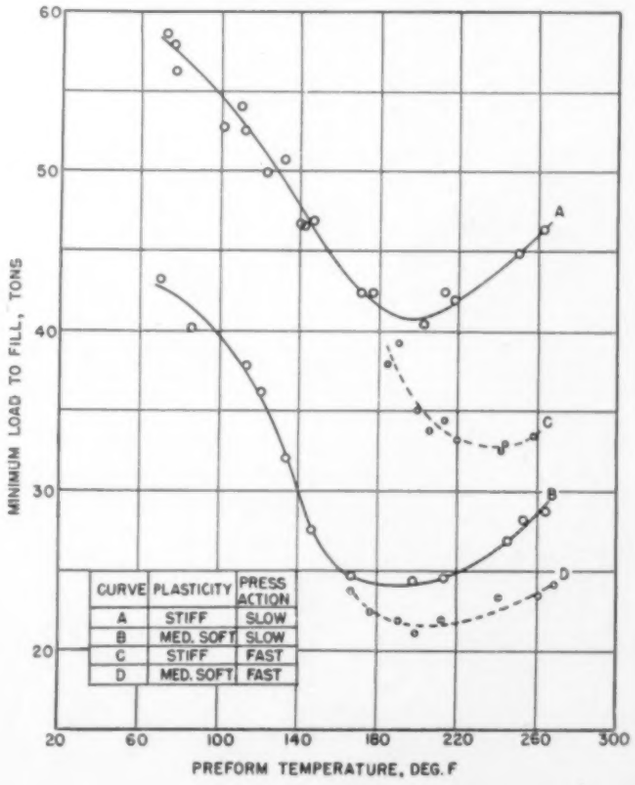
Material	*% pressure reduction*
BM-14317 Gen. purpose—av. curing	59
BM-15140 Gen. purpose—fast curing	43
BM-261 Heat resistant—fast curing	51
BM-11478 Electrical—fast curing	38

A study of the advantages of H.F., preheating for molding radio cabinets (Fig. 8) showed that a pressure reduction up to 33% over that required by cold material could be obtained, depending on the exact material used. Also, mold closing time was shortened by 50 to 75% and cure time to 25% of the minimum found when using cold material, as would be expected. No significant differences were found in the molded specific gravities of the bottom and the top of the radio cabinets or in the shrinkage, when molded at the lowest practical pressure using either H.F. preheated or unpreheated materials. Of particular interest was the fact that H.F. preheated mottle materials generally gave a greater contrast of colors, a less spotted appearance, and a better-looking wood-grain pattern. Preheated preforms could also be used with less danger of obtaining a "sunburst effect." Apparently when using H.F. preheating there is less internal friction developed in flowing the two-toned materials during molding, with the result that the turbulence normally obtained is minimized.

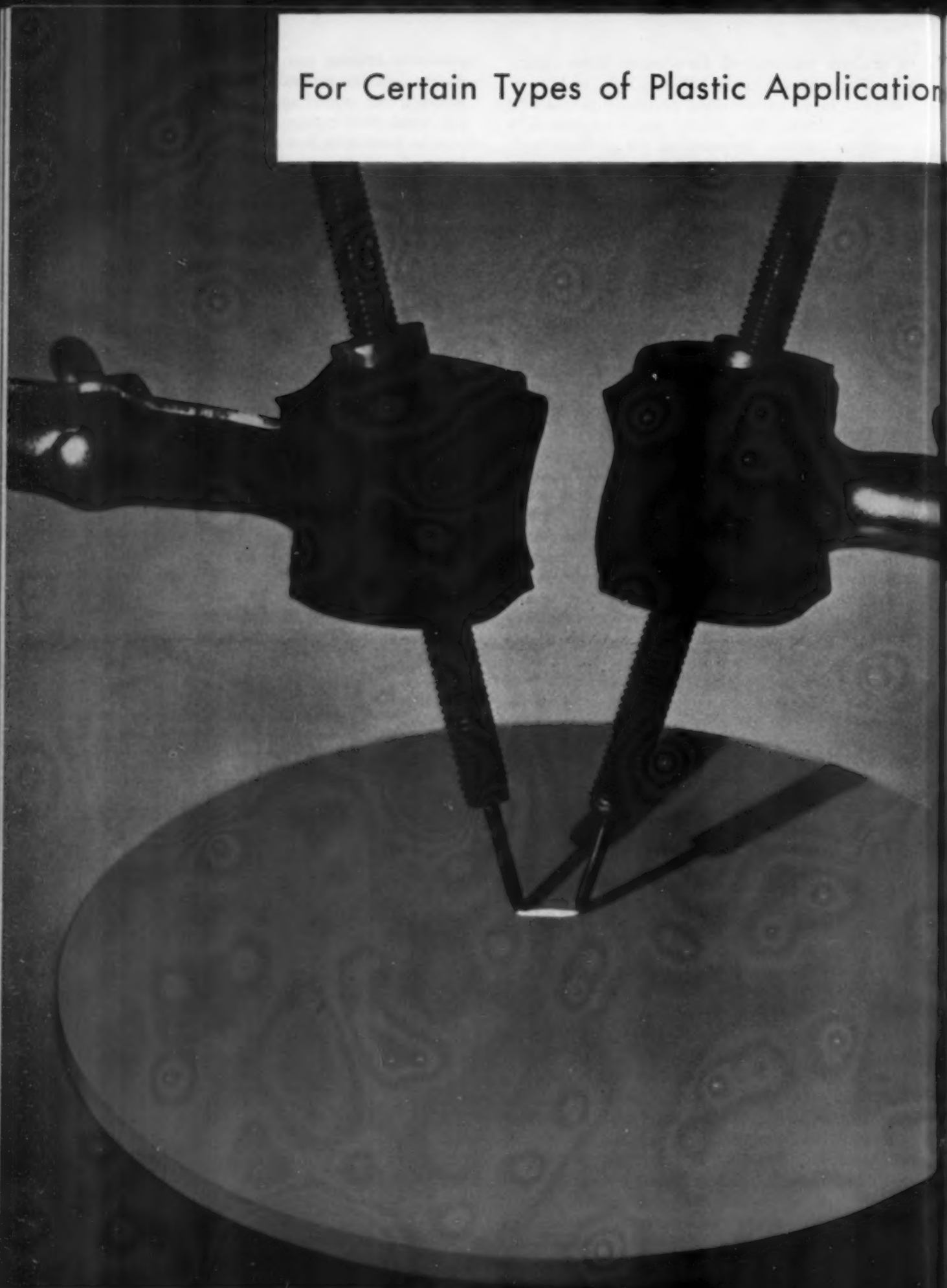
High frequency preheating, however, did not permit any pressure reduction in the molding of a washing machine agitator using preforms. In this mold the preheated preform charge remained near the flash line until the mold was practically closed. The material then had to be forced down into the recessed areas of the mold, whereas when cold powder was used, the charge naturally fell into these areas and there was less tendency to trap air and give low density moldings. When several different materials were H.F. preheated in powder form using a special technique[1] in an endeavor to overcome this difficulty, all except a diced impact material cohered into a solid putty-like mass, and no advantage was obtained. However, preheating the diced impact material did result in a 43% reduction in pressure. As would be expected, all the H.F. preheated materials showed a two to sevenfold reduction in cure times and appreciably shorter mold

(*Please turn to page* 96)

7 — Minimum load-to-fill shaker cup mold versus preform temperature of high frequency preheated fast-curing general purpose phenolic material



For Certain Types of Plastic Applicatio



Plaskon Alkyd has the highest arc resistance of any plastic material. High-frequency arc (above) leaves no traces of carbon after several minutes of open current.

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LOWER IN COST!

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Advantages of this new Plaskon Alkyd are:

- ULTRA-HIGH SPEED MOLDING
- LOWER MOLDING PRESSURES
- SIMPLER, LESS BULKY MOLDS
- HIGH ARC RESISTANCE
- LIGHTER, MORE COMPACT PRESSES
- SUPERIOR DIMENSIONAL STABILITY
- HIGH SOLVENT AND CHEMICAL RESISTANCE
- EXCELLENT HEAT RESISTANCE

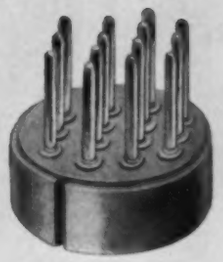
This new Plaskon Material is best adapted to small compact dies installed in fast-closing air- or hydraulic-operated presses . . . features which mean that manufacturers of plastic products can utilize less expensive equipment, and speed up the production of their molded goods.

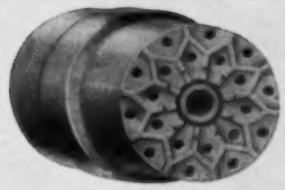
Present available colors are natural tan and black.

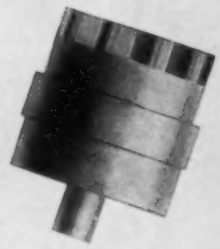
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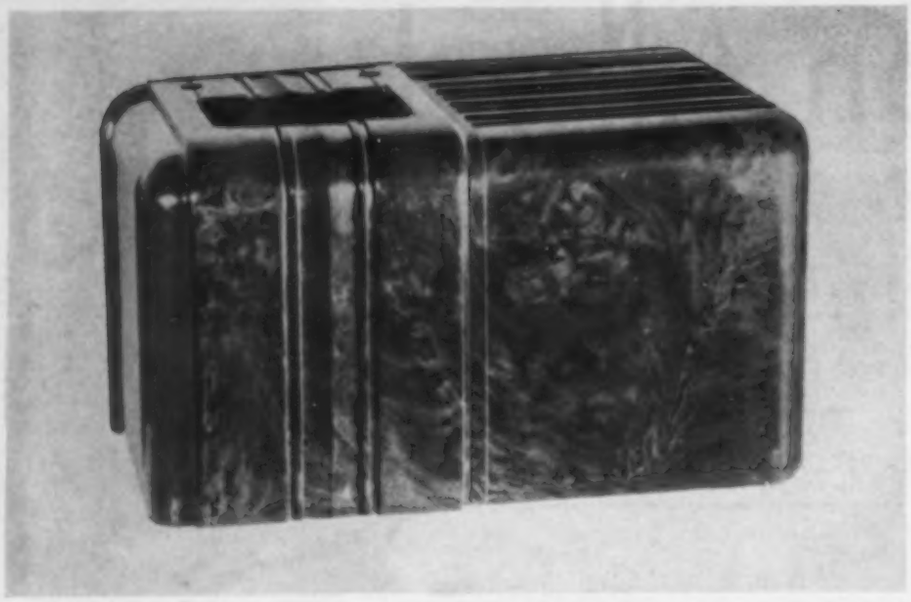




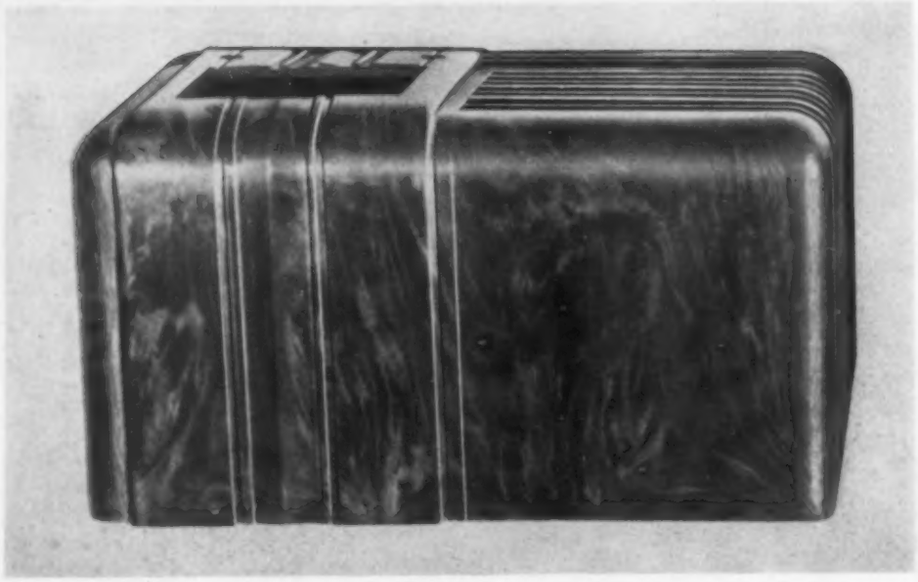




⅛" thick plastic forms can be cured in 10 seconds. Other pieces ⅛" or thicker will take about 50 to 80 seconds. No danger of over-curing; heat resistance of cured Plaskon Alkyd Molding Compound is greater than normal molding temperatures.



8a — Oven preheated mottled phenolic produced a sunburst effect in the molded radio cabinet at left. Hard components of mottle had poor flow



8b — High frequency preheating mottled phenolic material achieved smooth flow as indicated by wood grain pattern in the molded radio cabinet at right

closing times. At these short cures the moldings showed no greater tendency to warp; shrinkage was practically normal, although in general it was about 0.0015 in. higher than that obtained with oven-preheated powder.

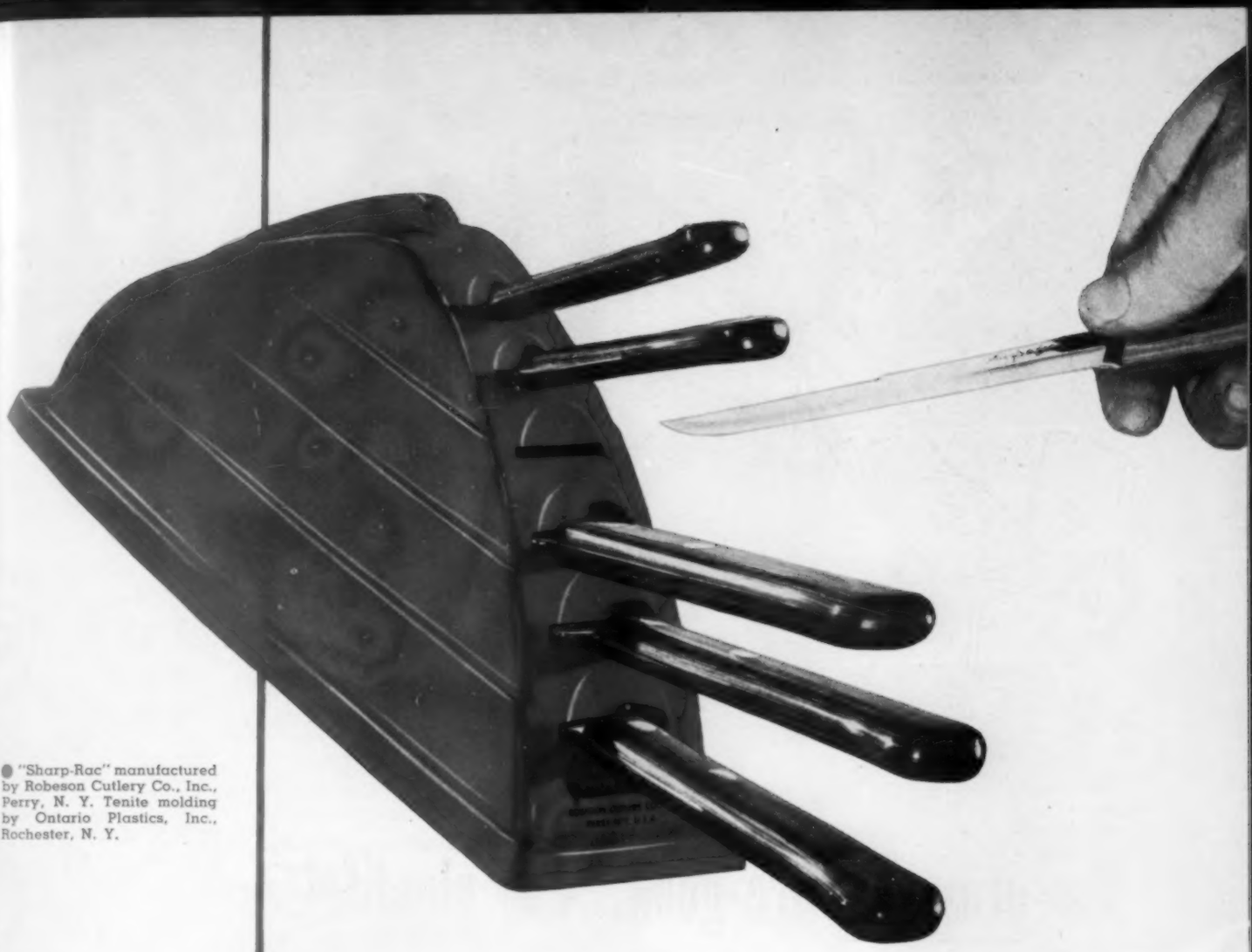
In transfer molding standard tensile and flexural bars of a phenolic impact material, 40 and 25% pressure reductions, respectively, were obtained; tests on transfer molding an M-52 fuse showed a 50 to 65% reduction in pressure and made it possible to mold fuses within the narrow length specifications for a greater variety of materials.

Summary

Today, when many H.F. generators and molding presses—especially the larger ones—are being operated at their peak capacity, more attention is being given to the factors and variables affecting the heating rate of preforms of thermosetting materials and the conditions giving the greatest possible pressure reduction in molding. Variations in electrode spacing and in the height and density of preforms affect the heating rate and can be controlled by the molder. The pressure reduction obtained depends on many interrelated factors such as the preform temperature, the preheating and handling time, and the design of the mold. The preform temperature which will give the greatest pressure reduction may vary considerably from job to job and is best determined experimentally. Molds in which flow is in the direct line of movement of the force give pressure reductions between 25 and 60% over use of unpreheated material.

Acknowledgements

The author gratefully acknowledges the assistance in this work of C. E. Staff and R. E. Nicolson of the Research Labs., A. P. Mazzucchelli of the Development Div., and R. V. Cole of the Sales Div. of the Bakelite Corp.



● "Sharp-Rac" manufactured by Robeson Cutlery Co., Inc., Perry, N. Y. Tenite molding by Ontario Plastics, Inc., Rochester, N. Y.

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Organic Peroxide Catalysts for Polyesters*

by C. H. RYBOLT† and T. C. SWIGERT‡

BENZOYL peroxide and several other organic peroxides have been used extensively as polymerization catalysts for vinyl type monomers. With the development of polyester resins, new techniques were developed, and several new organic peroxides were found to be useful catalysts. Each fabricating problem had to be analyzed separately because of the limited information available at that time concerning the properties of these new resins. A vast number of problems confronted the fabricators and manufacturers of resins, fillers, and catalysts. Advances have been made in solving some of these problems, but much remains to be done before the reinforced plastics industry can take its rightful place in the field of large volume production.

Benzoyl peroxide, as such or in an extended form as a paste, is still the best general purpose catalyst. It is readily available at low cost, and can be stored at room temperature for long periods of time without loss of activity. As a paste with tricresyl phosphate or as a suspension in styrene monomer, it is readily soluble in polyester resins. Benzoyl peroxide gives reasonably long tank life and is active at relatively low temperatures. Because of these combined properties it is the most widely used organic peroxide, particularly for laminating applications and to a lesser extent for molding and casting.

Catalyst requirements

Benzoyl peroxide, in spite of its general usefulness, does not fulfill the catalyst requirements for all of the varied applications of polyester resins. Resin manufacturers have sought to improve color, impact strength, resistance to water absorption, electrical properties, storage characteristics, and curing prop-

* This paper was presented under the title, "Organic Peroxides as Catalysts for Polyester Type Resins," at the Fourth Annual Technical Session of the Reinforced Plastics Div., Society of the Plastics Industry, held Jan. 12-14 in Chicago.

† Sales manager, Lucidol Div., Novadel-Agene Corp., Buffalo 5, N. Y.
‡ Technical Service Dept., Lucidol Div., Novadel-Agene Corp.

Table I.—Description of Organic Peroxides

Catalysts	*Physical form*	*Typical peroxide assay*	*Active oxygen*
Diacyl peroxides		%	%
Benzoyl peroxide (Lucidol)	Powder or fine granular	96	6.30
Benzoyl peroxide compounded with tricresyl phosphate (Luperco ATC)	Thick paste	50	3.30
Technical lauroyl peroxide (Alperox C)	Soft granular	95	3.76
2,4-Dichlorobenzoyl peroxide compounded with dibutyl phthalate (Luperco CDB)	Thick paste	50	2.10
p-Chlorobenzoyl peroxide	Fine granular	95	4.90
p-Chlorobenzoyl peroxide compounded with tricresyl phosphate (Luperco BTC)	Thick paste	50	2.50
Aldehyde peroxides			
Hydroxyheptyl peroxide	Fine powder	95	5.80
Dibenzaldiperoxide compounded with tricresyl phosphate (Luperco ETC)	Thick paste	50	6.60
Ketone peroxides			
Methyl ethyl ketone peroxide in dimethyl phthalate (Lupersol DDM)	Liquid	60	11.00
1-Hydroxycyclohexyl hydroperoxide-1	Granular	90	11.00
Methyl isobutyl ketone peroxide in dimethyl phthalate (Lupersol FDM)	Liquid	80	11.00
Methyl amyl ketone peroxide	Liquid	95	15.50
Alkyl hydroperoxides			
t-Butyl hydroperoxide	Liquid	60	10.60
Alkyl peresters			
Di-t-butyl diperphthalate	Granular	95	9.80
t-Butyl perbenzoate	Liquid	95	7.80
Alkyl acid peresters			
t-Butyl permaleic acid	Fine crystalline	95	8.10
t-Butyl perphthalic acid	Fine granular	95	6.40

Table II.—Selection Chart for 17 Commercially Available Catalysts for

Catalyst[a]	*Laminating and molding operations* — *Rigid or semi-rigid resins* — Usual range of curing temperatures	Catalyst concentration[b]	Rate of solubility of catalyst in monomer	Rate of initiating polymerization[c]	Curing rate[c]	Peak of exothermic reaction[c]	Tank life of resin-catalyst system[c]	*Flexibl.* — Usual range of curing temperatures	Catalyst concentration[b]	Rate of solubility of catalyst in monomer
	°F.	%						°F.	%	
A. Low temperature group	75 to 240			Rapid	Rapid	High[d]	Short (Not suggested for continuous laminating)			
Hydroxyheptyl peroxide		1.5	Fair						2.0	Fair
Lupersol FDM		0.5	Very good						1.0	Very good
Lupersol DDM		0.6	Very good	At curing temps. of 75-90° F., gel times and curing rates can be regulated to some extent by changing the catalyst concentration.					1.0	Very good
1-Hydroxycyclohexyl hydroperoxide-1	90 to 240	0.5	Fair						1.0	Fair
Luperco CDB		3.0	Good						4.0	Very good
t-Butyl hydroperoxide		0.6	Very good					150 to 250	1.0	Very good
B. Intermediate group	150 to 300			Rapid to slow	Rapid to slow	High	Short to Long			
Methyl amyl ketone peroxide		0.5	Very good	Unlike catalysts in group A, these peroxides have a wide range of variation in gel times and cure rates at curing temps above 150° F. Slight adjustments in catalyst concentration do not affect established curing rates and gel times. Catalyzation of unmodified allyl resins is generally limited to catalysts in groups B or C. Catalyst mixtures in total concentration up to 3% may be used with these resins.					1.0	Very good
Alperox C		1.5	Fair						2.5	Good
Benzoyl peroxide		1.0	Fair						2.0	Good
Luperco ATC		2.0	Good						4.0	Very good
t-Butyl permaleic acid	190 to 300	0.8	Fair						1.5	Poor
t-Butyl perbenzoate		0.8	Very good						1.5	Very good
Di-t-butyl diperphthalate		0.7	Fair						1.5	Good
t-Butyl perphthalic acid	210 to 300	1.0	Fair						2.0	Poor
p-Chlorobenzoyl peroxide		1.3	Fair						2.5	Good
Luperco BTC		2.5	Good						5.0	Very good
C. High temperature group	240 to 300			Slow	Slow	Low	Long			
Luperco ETC		1.0	Good						2.0	Very good

[a] The individual catalysts are listed in order of decreasing ability to gel polyester type resins at room temperature.
[b] The concentrations suggested are subject to recommendations made by individual resin manufacturers.
[c] Using benzoyl peroxide catalysed resins as the basis of comparison.
[d] The ability of a catalyst to yield rapid cures at room temperature may require the addition of a promoter or accelerator to the resin-catalyst mixture. A mixture of two catalysts may be used for high temperature castings.

Polyester Type Resins

Resins				Casting		
				Rigid or semi-rigid resin		
Rate of initiating polymerization[a] / Curing rate[a]	Peak of exothermic reaction[a]	Tank life of resin-catalyst system[a]	Curing temperature[a]	Catalyst concentration[b]	Tank life of resin-catalyst systems[a]
				%	
Variable	Medium or low[c]			1.0 to 3.0	
Slower gel times and curing rates are characteristics of flexible resins as compared with rigid types especially at low curing temps. Higher catalysts of group A or lower catalysts of group B will be useful in catalyzing flexible resins.		Short to long	Room temp. (75° F.) or higher	0.5 to 3.0	Short
				3.0	
		Medium			Short to Long
				0.5 to 3.0	
Acidic peresters in group B may be difficultly soluble in flexible resins. Luperco ETC will give curing rates equivalent to Luperco CDB as described above, but gel times will be slower. Luperco compounds ATC, BTC, or ETC are especially useful if the finished polymer is post-cured at a high temp. for a long period of time.		Medium to long	Above room temp.		Long
				1.0 to 3.0	

Curing temperature designated "above room temp." may be reduced if a two component catalyst system is employed.
[c] Luperco CDB will give a relatively low exotherm peak under any conditions of catalyst concentration or curing temperature.

erties of their resins. In order to gain full advantage of these improvements, it may be necessary to re-evaluate peroxide requirements. Considerable interest has been shown in room or slightly elevated temperature cures of polyester resins. Benzoyl peroxide alone is not suitable for this application, but promoters are available which, when used with benzoyl peroxide, make room temperature cures possible. However, many fabricators feel that this additional variable should not be added if the same results can be obtained by the use of the proper resin and catalyst combination. Many new organic peroxides representing a wide range of catalytic properties are now available for evaluation with resins. If no satisfactory resin-catalyst combination can be found, the fabricator also has this selection of peroxides available for evaluation with promoters. For certain operations, the size and shape of the piece being fabricated limit the amount of heat which can be applied or tolerated through "exotherm" development. As a result, special catalysts are required to meet these conditions. A catalyst mixture composed of two organic peroxides has been found advantageous in certain cases where the control of exothermic heat is important.

Thus, it can be seen that the development of improved resins and the diversified requirements of the fabricator have made it necessary for the catalyst supplier to have available a wide variety of products from which to choose. Selection of the proper resin-catalyst combination will enable the fabricator to develop balanced properties in the finished product using an established curing cycle at specified time and temperatures.

The choice of a catalyst for a particular resin application depends upon four factors: 1) the resin used in the operation; 2) the curing temperature employed; 3) the tank life required; and 4) the approximate gelation time or induction period involved. There is no catalyst formulation available at present which will collectively satisfy all specifications such as curing temperature, tank life, and gelation time if the fabricator expects the ultimate in each factor. It is possible, however, to achieve a practical working schedule by utilizing one or more commercially available catalysts having properties in close conformity to those desired. It is suggested that improvements in existing schedules may be obtained by a critical survey of the catalyst requirements.

Properties of commercial catalysts

Commercially available organic peroxides used in the bulk polymerization of polyester resins are listed in Table I according to chemical classification. Commercial designations and/or chemical composition, physical form, peroxide and active oxygen contents are given for each catalyst. Inspection of Table I will show that several types of organic peroxides are rep-

(*Please turn to page* 150)

Coalescence Behavior of Some High Polymers

by H. P. MEISSNER* and E. W. MERRILL†

COALESCENCE is normally defined as a growing together or merging, as of two liquid droplets. The term is extended here to describe the formation of bonds involving no mechanical interlocking between two surfaces of a given high polymer. Such bonds also fall within the scope of the definition of adhesion by A.S.T.M. Committee D-14, namely "the state in which surfaces are held together by interfacial forces which may consist of valence bonds," etc. These bonds are nevertheless described as coalescent since, as discussed below, they usually form only above the transition temperature of the polymer in question, in which region the polymer behaves as a liquid of high viscosity. It is the object here to consider certain limiting conditions of such coalescent bond formation.

It is common experience that coalescence develops only at or above the melting point for a low molecular weight substance, in that liquid surfaces of such a material coalesce immediately upon contact, while its surfaces, when solid, show no evidence of bond formation. This is presumably because coalescence requires orientation of the molecules and atoms in one surface relative to those in the other to allow their force fields to interlock, and there is insufficient mobility in the solid state to make such orientation possible. This, of course, does not mean that solid surfaces of a given material never stick together. For example, it is well known that freshly split mica sheets will form a weak bond upon being brought into contact. Mica splits so readily along a single crystal plane that the atoms in the resultant flat surfaces probably retain some of their original orientation. Hence with fresh mica surfaces, a sufficient number of the force fields not yet blocked off by adsorbed water vapor, grease, etc., can key together to produce sticking. Such bonding is not possible with most freshly-formed solid surfaces, since these are normally not plane and do not show any such favorable orientation of the surface atoms.

The behavior of thermoplastic high polymers is of special interest, of course, since this class includes many technically important adhesives. These materials are unusual, in that they usually do not exhibit very well-defined melting temperatures. Some of these materials show first order transitions, analogous to true melting, as for example the linear condensation polymers investigated by Baker and Fuller.[1] Others undergo second-order transitions, as discussed by Boyer and Spencer.[2] These transition temperatures have been shown to place certain limitations upon the adhesion of such materials to surfaces of different composition.[3] Therefore, the relation of these transitions to coalescent behavior, that is, to the capacity of two surfaces of a given polymer to stick together, was investigated.

* Massachusetts Institute of Technology, Cambridge, Mass.
† Now with Dewey and Almy Chemical Co., Cambridge 40, Mass.

[1] "Thermal evidence of crystallinity in linear polymers," by W. O. Baker and C. S. Fuller, Ind. Eng. Chem. *38*, 272-277 (1946).

[2] "Advances in colloid science," by R. S. Spencer and R. F. Boyer, Vol. II, Chap. I. 1946. New York: Interscience Publishing Co.

[3] "Some factors affecting adhesive bond formation," by H. P. Meissner and E. W. Merrill, ASTM Bulletin No. 151, 80-83 (March 1948).

[4] "Über polystyrolgläser verschiedener kettenlänge," by E. Jenckel and K. Ueberreiter, Z. Phys. Chem. *A182*. 361-383 (1938).

Materials

The materials investigated are described in Table I. All the powders used were 20 mesh or finer. Ethyl cellulose and polyvinyl alcohol were dehydrated over phosphorus pentoxide for several days prior to use. The other resins were found to be relatively water insensitive and so were not conditioned over phosphorus pentoxide, but were kept in a vacuum for several days prior to use.

Experimental procedure

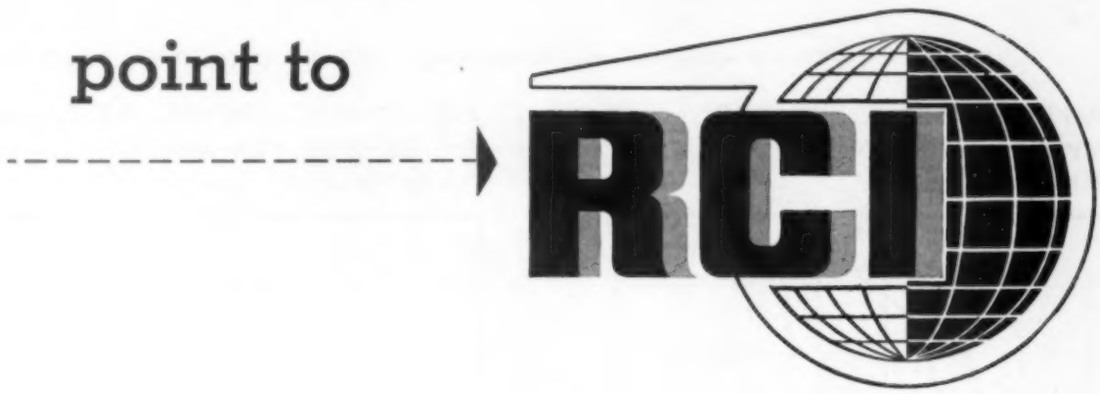
Transition temperatures. — These were obtained from density-temperature curves, the density being determined in a mercury-filled dilatometer, designed after Jenckel and Ueberreiter,[4] placed in a thermostatic bath constant to $\pm 0.05^\circ$ C. The volume was read after 20 to 30 min. time at each temperature. To establish the transition temperatures at elevated pressures, the alternative method of determining heating and cooling curves was used. A thermocouple was imbedded in a fused mass of the resin under test, which in turn was placed within a suitable closely-fitting mold. After applying pressure, the temperature of the resin was recorded as a function of time as the block cooled in quiet air, or was heated on a constant temperature platen.

Disk preparation. — Granulated resin was loaded into a mold consisting of a heavy-walled steel cylinder ½ in. in inside diameter, fitted with steel plugs. After reaching the desired temperature, pressure was applied at this constant temperature, usually for a half-hour period, by use of a hydraulic press. Disks formed had a diameter of ½ in. and a thickness lying between 0.01 and 0.15 inch. Prior to testing, the disks were conditioned over phosphorus pentoxide if hygroscopic, otherwise in an atmosphere of 44% relative humidity.

Flat surface tests. — To test for first evidence of coalescence, thin homogeneous disks were sanded or split, to expose fresh surface, and then pressed

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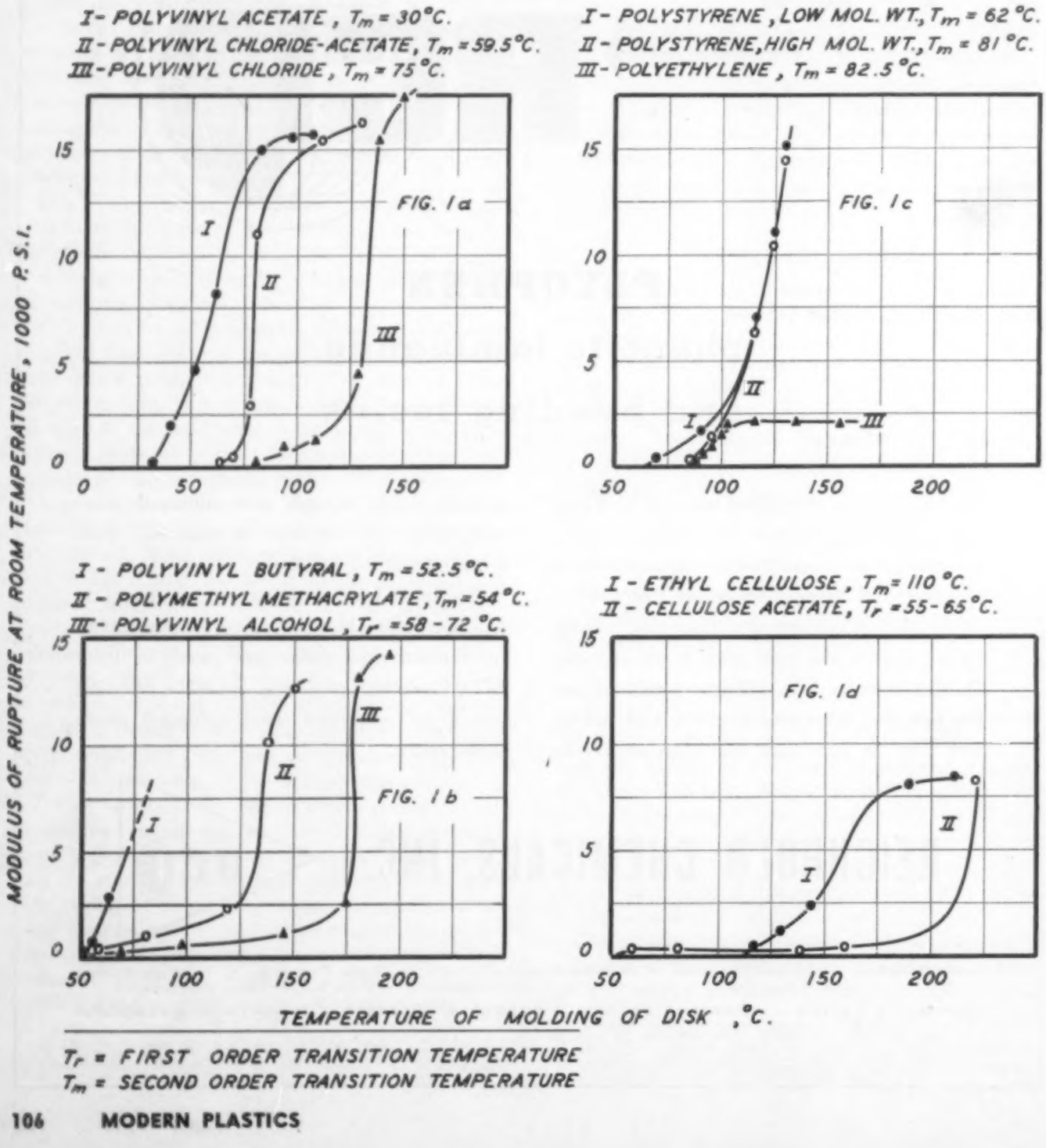
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together at various temperatures between the heated platens of a press. Coalescence bonding was considered to occur when a joint formed which was not attributable to mechanical interlocking, but which required application of a tensile force to break. The force so required varied from the barely detectable to a maximum value corresponding to the material's tensile strength, depending on the degree to which coalescence had developed.

Disk strength tests. — Rupture strength at room temperature was determined for disks molded from resin granules. Tests involved supporting a disk on two parallel edges ¾ in. apart, and applying stress with a knife edge placed across the disk diameter midway between the supporting edges and parallel to them. Loading was always at a constant rate (usually 25 lb./min.) and the break always occurred under the knife edge. Flexible materials like polyvinyl alcohol and polyvinyl butyral were loaded at the much faster rate of 300 lb./sec. to prevent the disks from doubling over the knife without breaking.

The following beam formula was used to obtain S, the modulus of rupture: $S=6Fl/bh^2$. In this equation, F is half the force in pounds applied at rupture

1 — Effect of molding temperature on disk strength. (Disks molded under 140 p.s.i. pressure for ½ hr.)





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Table I.—Transition Temperatures of Materials Tested.

Material	*Supplier*	*Particles*	*Molecular weight* [a]	*Second-order transition temp., °C.*
Polyethylene	Du Pont A6960	Flake-like	Medium	82.5 [b]
	Du Pont A6961	Flake-like	Low	80.5 [b]
Polystyrene	Dow Y-1-K27	Irregular granules, 30 mesh and fines	Low	62
	Dow R-1-K27, CA		High	81
Polyvinyl acetate	Du Pont	Spherical beads, 20 mesh	Low	30
			Medium	30
			High	34
Polyvinyl chloride-acetate	Bakelite VYHH	Fine powder	.....	59.5
Polyvinyl chloride	Bakelite QYNA	Fine powder	.....	75
Polyvinyl butyral	Du Pont VF7100	Irregular granules, 20 mesh	.....	52.5
Polyvinyl alcohol	Du Pont	Fine powder	.....	58
Polymethyl methacrylate	Du Pont	Spherical beads	.....	54
	Du Pont	Irregular granules	.....	54
Ethyl cellulose	Du Pont	Flake		
Cellulose acetate	Du Pont	Irregular granules, 30 mesh	.....	46-49 [c]

[a] Manufacturer's designation.
[b] Boyer and Spencer have pointed out that this is not a second order temperature in the ordinary sense, in spite of the discontinuity in the slope of the volume-temperature curve, but rather the temperature at which crystallinity starts to disappear; i. e., a premelting anomaly.
[c] First order transition.

to the disk by the knife edge, l is the ⅜-in. distance from the knife edge to the supports, b is the length of the test piece under the knife edge (here the disk diameter of ¼ in.) and h is the disk thickness in inches. The modulus of rupture, of course, bears no simple relation to the tensile strength, and should be considered merely as a relative measure of the coalescence attained.

Transition temperatures

The observed transition temperatures are listed in Table I, and are in substantial agreement with the literature. It will be noted that the transitions shown by these materials were all of the second order with the exception of cellulose acetate, which showed a first order transition. It appeared further that second order transition temperatures, at least for polystyrene, were unaffected by compression in a mold to a pressure of 36,000 p.s.i.

Coalescense of flat surfaces

By use of the qualitative tests described above, it was found that when smooth flat sheets of the resins were pressed together, a critical temperature existed unique to each material, below which no evidence of coalescence could be found. This temperature was in each case substantially independent of pressure up to 10,000 p.s.i. for compression durations of 8 hours. These critical coalescence temperatures were found to coincide with the transition temperatures of the materials tested, as listed in Table I.

As is to be expected from this correspondence of the transition temperature and the critical coalescence temperature, both are equally affected by molecular weight changes, and by additions of plasticizers and solvents. For example, in the typical case of polystyrene, it was shown by Jenckel and Ueberreiter[4] that the second order transition temperature increases with molecular weight until a value of about 60,000 is reached, after which the transition temperature remains essentially independent of further molecular weight increases. In line with this, the "high" and "low" molecular weight polystyrenes tested had transition temperatures of 81° C. and 62° C., respectively, which were found to correspond with their critical coalescence temperatures. Similarly, these temperatures are markedly reduced by the addition of plasticizers. For example, the second order temperature of polyvinyl butyral was reduced from 52.5 to 37° C. by incorporation on a rubber mill of 6% of triethylene glycol di-2-ethyl butyrate as plasticizer. When pressing together flat sheets of this material for 30 min., evidence of coalescence could be found at 45° C. but not at 27° C. When 12.3% by weight of the same plasticizer was incorporated into polyvinyl butyral, the second order transition was found to be 21° C., and evidence of coalescence could be found at 25° C. but not at 15° C.

The rapidity with which coalescence rates fall off below the second order transition temperature is well illustrated by the following experiments. Sheets of polyvinyl acetate, pressed together at 10,000 p.s.i. for 2 min. at 10 degrees Centigrade above this material's second-order transition temperature, showed

(*Please turn to page* 158)

PARAPLEX

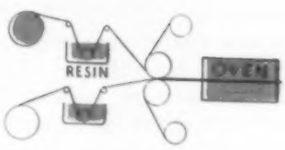
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PLASTICS DIGEST*

Abstracts from the world's literature of interest to those who make or use plastics or plastics products. Send requests for periodicals to the publishers listed

General

PROFESSIONAL EDUCATION IN PLASTICS ENGINEERING. SPE News *4*, 3-5 (Nov. 1948). An integrated program of professional engineering education in plastics, together with a sketch of the types of professional engineers required in industry and the opportunity thus open to educational institutions in preparing such men for professional careers are presented.

MICROBIOLOGICAL DETERIORATION OF ORGANIC MATERIALS: ITS PREVENTION AND METHODS OF TEST. E. Abrams. National Bureau Standards Misc. Publication 188, 41 pps. (Nov. 1, 1948). A detailed review of the literature on the microbiological deterioration of organic and fibrous materials is presented. Representative problems incidental to the development of test methods for the evaluation of mildew resistance and the development of mildew resistant materials are discussed. The most widely recognized test methods for the evaluation of mildew-resistance and rot-resistance are listed. A wide variety of fungicides for different uses is classified according to effectiveness. Plastics and plasticizers and related materials are rated according to their susceptibility to support mold growth.

DIRECTORY OF PLASTIC MERCHANDISE. Canadian Plastics *6*, 23, 25-5, 28, 31, 33-4, 37-8, 41, 44, 47, 49-50, 52, 55-6, 59-61, 63-4, 67-9, 71, 73-7 (Sept. 1948). Canadian sources of supply for various types of articles molded of plastic and in common use in the home and commercial establishments are given.

METALS AND PLASTICS. R. G. Chollar. A.S.T.M. Bulletin No. 152, 80-7 (May 1948). The properties, production, costs and relative uses of plastics and metals are compared. The properties considered are specific gravity, hardness, shock resistance, tensile strength, thermal expansion, thermal conductivity, heat resistance, dielectric strength, modulus of elasticity, damping characteristics, creep and cold flow, weathering and surface effects. Applications in business machinery are discussed; 51 references.

PROBLEMS IN THE INDUSTRY. C. A. Breskin. British Plastics *20*, 607-9 (Dec. 1948). The problems involved in changing from a sellers to a buyers market in the plastics industry are discussed. A report on this same talk is given under the title "On Selling Plastics" in Plastics (London) *12*, 623-5 (Dec. 1948).

Properties

THEORIES OF ADHESION AS APPLIED TO THE ADHESIVE PROPERTIES OF HIGH POLYMERS. C. J. Seiler and A. D. McLaren. A.S.T.M. Bulletin No. 155, 50-2 (Dec. 1948). A study of adhesion requires a knowledge of three factors, namely, the character of the bond between the adhesive and the surface to which it adheres, the nature of the film, and the nature of the surfaces permitting adhesion. A knowledge of optimal application methods may determine whether a good or poor bond is obtained from an adhesive. However, the differences in bond strengths obtained from adhesives having similar physical properties but dissimilar chemical composition can only be explained in terms of specific adhesion factors. Electrical forces resulting from the dipole moments of polymer polar substituents and ordinary dispersion of forces are used to explain the strengths of adhesive bonds.

SILICONE RUBBER—NEW PROPERTIES FOR DESIGN ENGINEERS. G. S. Irby, Jr., W. Goss, and J. J. Pyle. Trans. A.S.M.E. *70*, 831-6 (Oct. 1948). Silicone rubber is a synthetic elastomer which exhibits exceptional properties of thermal stability. The physical, chemical, and electrical properties of this material, as affected by high and low temperatures, are reported. The flexibility range is from −70 to +500° F. The resistance to oxidation and heat-aging are excellent. It has low compression set and good electrical properties. It can be fabricated by molding, extrusion, and laminating. Wire-coating, cloth-coating, and bonding techniques have been developed. Proper design factors for applications are described.

Materials

HERCULES MAKES RESINS FROM ROSIN. J. A. Lee. Chem. Engineering *55*, 129-32 (Nov. 1948). The production of hydroabietyl alcohol from rosin and the synthesis of several resins from this alcohol are described.

FIBRENYLE. A. Amigo. British Plastics *20*, 560-5 (Dec. 1948). The fabrication of articles from a cold molding thermoplastic material made with various resins and fillers in sheet form is described.

Chemistry

POLYMER CONSTITUTION AND FIBER PROPERTIES. R. Hill and E. E. Walker. J. Polymer Sci. *3*, 609-30 (Oct. 1948). The chemical structure of a large number of linear condensation polymers is correlated with their ability to assume a polycrystalline form possessing the right degree of thermal stability, and with the possession of fiber forming properties. Certain structures lead to the absence of crystallinity and of fiber-forming properties, while, under certain conditions, a low degree of crystallinity or its complete absence leads to polymers possessing rubberlike properties, which may form highly elastic threads. Some properties of fibers such as solubility, sensitivity to moisture, and certain dyeing characteristics, can be correlated to some extent with chemical structure. These effects are considered on the basis of the introduction of various polar links and ring structures, according to regular patterns, into the polymethylene chain. The ether and ester links lower the crystallite melting point to such an extent that some polymers containing them are completely noncrystalline at normal room temperatures. Urethan, amide and urea links raise the crystalline melting point. The in-

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troduction into the aliphatic chain of ring structures, particularly aromatic rings directly attached to polar groups, raises the crystallite melting point, but in this case symmetry exerts an over-ruling effect. A low degree of symmetry may lower the melting point and even eliminate crystallinity entirely to the detriment of fiber-forming properties. Inert side chains lower the melting point considerably, and in some cases render the polymer completely noncrystalline at normal room temperatures.

POLYMER SOLUTIONS. H. M. Spurlin. J. Polymer Sci. *3*, 714-34 (Oct. 1948). There are no unusual principles involved in polymer-solvent interaction. All of the observed facts can be interpreted on the basis that in a polymer molecule there are many units of structure, possibly differing in chemical nature, that are constrained to remain in their original linkages to one another but are otherwise free to move independently. The interaction of solvents with these units of structure will be very similar to that of low-molecular substances. Because of the constraints imposed by the linkages between units, and the fact that samples of polymer contain molecules of differing size, many phenomena such as crystallization and phase-rule behavior of polymer systems differ quantitatively from those observed with small molecules. A simplified picture of the concepts of polymer-solvent interaction is given.

BUTADIENE-FURFURAL COPOLYMERS. J. C. Hillyer, S. Swadesh, M. L. Leslie, and A. P. Dunlop. Ind. Eng. Chem. *40*, 2216-20 (Nov. 1948). The major source of the polymeric residue formed in the furfural extractive distillation method for purification of butadiene was found to be due to a reaction of butadiene with furfural. A compound, a copolymer of two molecules of butadiene and one of furfural, was isolated from plant residue and is shown to be 2,3,4,5-bis (Δ^2-butenylene)-tetrahydrofurfural. The same compound was synthesized in quantity by direct reaction of furfural and butadiene under conditions simulating those in the plant. Proof of structure and data on the effect of various conditions on formation of this copolymer are presented.

ACIDITY AND NUMBER OF CONSTITUENT CATION EXCHANGE GROUPS. H. P. Gregor and J. I. Bregman. J. Am. Chem. Soc. *70*, 2370-3 (July 1948). A true cation exchange resin is a solid phase containing dissociable cations which will exchange for any other cation independently of the nature of the anion of the exchanging cation in solution. A base absorbent is a solid phase containing dissociable cations which will exchange for any other cation only when weak acid anions or hydroxyl ions are the anions of the exchanging cation in solution. A comparable definition would restrict true cation exchange resins to those which contain only completely dissociated acidic groups, i. e., strong acid resins.

APPLICATIONS OF MAGNETOCHEMISTRY TO POLYMERS AND POLYMERIZATION. P. W. Selwood. J. Research National Bureau Standards *41*, 151-62 (Aug. 1948). Two topics are considered: First, studies of the dimagnetic anisotropy of crystalline and oriented materials. Second, attention is devoted to the paramagnetism of oxygen and free radicals that can be utilized as a measure of the concentration of the species. Radical concentrations as low as 10^{-4} mole per liter may be estimated by means of a modification of the Gouy-balance. It was employed in a study of the thermal polymerization of styrene at 66° C. From the changes in diamagnetism in

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the course of the reaction, the rate of consumption of oxygen present is determined. Assuming this to be due to combination with styrene radicals, the rate of thermal initiation is estimated to be 3.8×10^{-14} mole^{-1} liter sec^{-1}. However, in order to obtain by magnetic methods directly the free radical concentration in ordinary chain polymerization processes, the sensitivity would have to be improved by several orders of magnitude.

AMINO RESINS. C. A. Redfarn. British Plastics *20*, 461-3 (Oct. 1948). Some of the recent evidence concerning the structure of amino resins is reviewed.

Molding and fabricating

GROWTH OF THE PRESS. J. L. Daniels. British Plastics *20*, 570-9 (Dec. 1948). The development of compression molding presses from 1795 to the present is reviewed.

THE B. A. R. PROCESS OF BOARD PRODUCTION. Plastics (London) *12*, 626-7 (Dec. 1948). A continuous process for molding phenolic plastic sheet is described.

SPECIMEN EMBEDMENT IN THE POLYESTERS. D. M. Taylor. Canadian Plastics *1948*, 12-13, 49 (July 1948). The use of transparent colorless polyester casting plastics for preserving specimens is described in detail.

PRESERVING SPECIMENS. British Plastics *20*, 390-1 (Aug. 1948). Biological specimens are dehydrated and mounted in transparent colorless plastic by a casting technique to preserve the specimen for study.

Synthetic Rubber

LOW WATER ABSORPTION COPOLYMERS. J. C. Madigan, L. H. Howland, E. R. Burns, and C. V. Bawn. Ind. Eng. Chem. *40*, 2384-7 (Dec. 1948). Two new copolymers of butadiene-styrene are described. One of these contains divinylbenzene as a crosslinking agent. These copolymers are nonstaining, have low water-soluble content, and improved electrical stability. They may be blended with natural and synthetic rubbers.

Correction

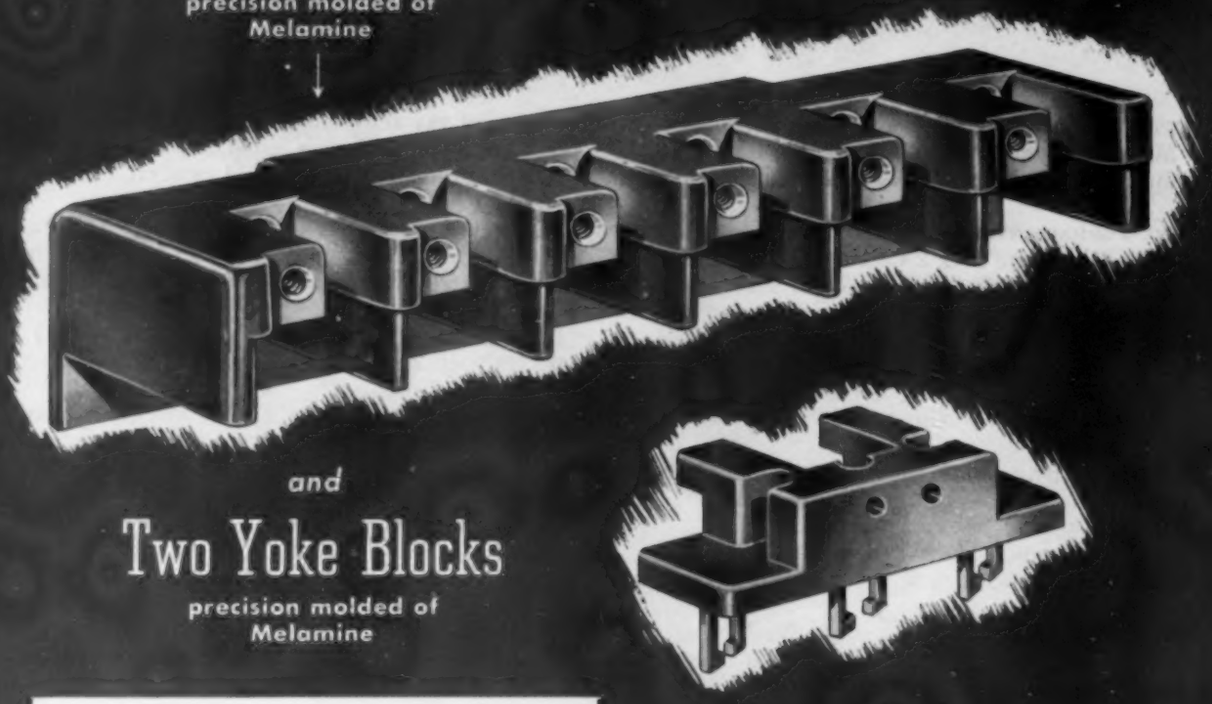
Through a printer's error which was not detected until our March issue was bound and mailed, the figures in Table II, page 96, of the article "Adhesives for Phenol-Formaldehyde Laminates" duplicated those of Table IV. Table II should be read as follows:

Table II.—Shear Strength of Bonds at —53° C.

Adhesive	*Shear strength*			
	Minimum	*Maximum*	*Average*	*St. dev.*
	p.s.i.	*p.s.i.*	*p.s.i.*	*p.s.i.*
Resorcinol A/Primer A	892	1048	988	60
Phenol A	1272	1434	1332	71

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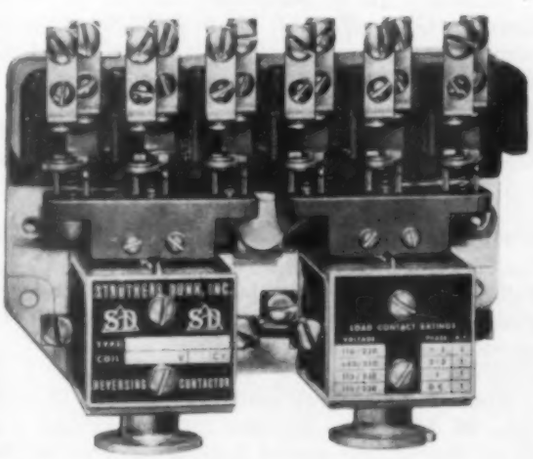
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U.S. PLASTICS PATENTS

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THERMOPLASTIC SHEET. M. M. Balsam and H. M. Balsam (to M. M. Balsam, Inc.). U. S. 2,451,794, Oct. 19. Machine for permanently folding sheets of thermoplastic.

MELAMINE-FORMALDEHYDE. G. Pitzel (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,451,867, Oct. 19. A partially polymerized melamine-formaldehyde resin insoluble in water below 35% concentration, dispersed in a polyhydric alcohol and containing hydroxy acetic acid.

MOLDING. W. F. Bradley. U. S. 2,451,912, Oct. 19. A loading device for plastic molding machines.

ORNAMENT. W. J. Brice. U. S. 2,451,913, Oct. 19. An embedded object in an ornamental plastic material.

MOLDING. C. A. Evans. U. S. 2,451,934, Oct. 19. Process for forming hollow plastic articles.

CAST POLYMERIZATION. N. C. Foster (to Westinghouse Electric Corp.). U. S. 2,451,935, Oct. 19. Method of cast-polymerizing by confining a liquid polymerizable material so that a thin layer is obtained in a portion thereof, heating the thin portion, cooling another side, and polymerizing successive portions until the entire mass has polymerized.

HYDROLYZED ISOCYANATES. D. J. Loder (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,451,963, Oct. 19. Subjecting a solution of hydrolyzed interpolymer of ethylene and vinyl acetate in dioxane to 30 to 200° C. with an alkyl isocyanate.

EXTRUSION. C. E. Slaughter (to Extruded Plastics, Inc.). U. S. 2,451,986, Oct. 19. Method of extrusion forming of thermoplastic resinous material.

COATING. W. C. Weltman and T. F. Dixon (to Westinghouse Electric Corp.). U. S. 2,452,005, Oct. 19. Resin composition comprising solvent-soluble phenol-aldehyde resin and a saturated aliphatic amine.

FIRE RETARDANT. G. Jones, W. Juda, and S. Soll (to Albi Manufacturing Co.). U. S. 2,452,054, Oct. 26. A reactive fire-retardant composition of urea, a source of formaldehyde, a carbohydrate, and a foam-forming ingredient.

EXTRUSION. W. T. Stephenson (to Dow Chemical Co.). U. S. 2,452,080, Oct. 26. Continuously extruding a tube of fused vinylidene chloride polymer at 120 to 190° C. and withdrawing from the die orifice through a cooling bath.

RUBBERY POLYMER. W. C. Ault and B. B. Schaeffer (to U. S.). U. S. 2,452,092, Oct. 26. Polymers prepared by auto-esterification of monohydroxystearic acid and ricinoleic acid.

POLYVINYL FORMAL. J. H. Rooney, J. H. Sharphouse, and P. R. Hawtin (to Celanese Corp. of America). U. S. 2,452,152, Oct. 26. Textile fabric resistant to penetration by mustard gas and water, coated with an aqueous solution of polyvinyl alcohol, dried, and reacted with a solution of formaldehyde and acid catalyst.

POLYMER. C. C. Unruh and W. O. Kenyon (to Eastman Kodak Co.). U. S. 2,452,165, Oct. 26. A resinous heteropolymer of isopropenyl acetate and maleic anhydride.

BUTTON. W. A. Zweibel (to Patent Button Co.). U. S. 2,452,173, Oct. 26. Plastic button.

POLYMERIZATION. R. M. Kennedy and S. J. Hetzel (to Sun Oil Co.). U. S. 2,452,198, Oct. 26. Olefins polymerized in the presence of silica gel, aluminna, and cobalt or nickel.

POROUS MATERIAL. H. M. Kvalnes and F. S. Chance (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,452,200, Oct. 26. Voids in porous material are filled by soaking in solution of urea-formaldehyde, adjusting the pH to 7 to 10.5, heating, and distilling water and excess formaldehyde from the resulting product.

CELLULOSE ETHER. C. E. Rehberg and C. H. Fisher (to U. S.). U. S. 2,452,209, Oct 26. Cellulose ether plasticized with bis(allyl lactate) maleate.

BLACKBOARD. L. J. Gold (to Milprint, Inc.). U. S. 2,452,235, Oct. 26. A blackboard comprising a black sheet of paper having a coating of ethyl cellulose, a glyceryl ester of hydrogenated rosin, castor oil, and a granular abrasive.

DRIER. R. R. Leiske. U. S. 2,452,249, Oct. 26. A drying unit for granular plastic material.

SILICONES. R. R. McGregor and E. L. Warrick (to Corning Glass Works). U. S. 2,452,254, Oct. 26. Fluid composition composed of a mixture of liquid polymeric dimethyl silicones.

PHONOGRAPH NEEDLES. W. H. Hutter. U. S. 2,452,304, Oct. 26. A phonograph needle comprising a stylus, a chuck engaging portion, and a nylon connecting portion.

PROTEIN COMPOSITION. W. L. Morgan and C. R. Faelten (to American Maize Products Co.). U. S. 2,452,-313-4-5, Oct. 26. A "prolamine-base" protein composition plasticized with an organic carboxylic amide, a phenol ether, or a cyclic imide.

RESIN. M. T. Harvey (to Harvel Corp.). U. S. 2,452,374, Oct. 26. Heating a mixture of acrolein and a distillate of an anacardic material until a resinous condensate is formed.

MOLDING. E. S. Long. U. S. 2,452,382, Oct. 26. An apparatus for molding objects from rubber or plastics.

MOLDING COMPOSITIONS. J. Allen (to Celanese Corp. of America). U. S. 2,452,420, Oct. 26. Molding stock pre-



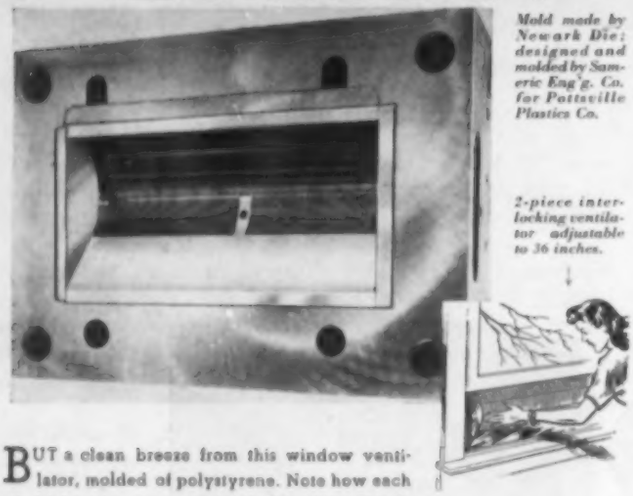
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IMPREGNANT. J. S. Kirk (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,452,536, Nov. 2. Impregnating leather with a solution of a sulfonated polymerizate of an unsaturated carboxylic acid and an olefin containing an aromatic substituent.

PLASTIC APPLYING MACHINE. C. F. Hammann (to North American Research Corp.). U. S. 2,452,565, Nov. 2. A machine for applying, spreading, and ironing plastics.

COPOLYMERS. M. M. Levine (to Cornell Aeronautical Laboratory, Inc.). U. S. 2,452,669, Nov. 2. In the copolymerization of a polyester with an unsaturated compound in the presence of a peroxy catalyst, the method of accelerating polymerization by adding triethanolamine, triisopropanolamine, or methyl diethanolamine.

COPOLYMERS. P. O. Tawney (to U. S. Rubber Co.). U. S. 2,452,700, Nov. 2. Heating together 2,5-dimethyl-1,5-hexadiene and a monomeric acrylic ester in the presence of a peroxy catalyst.

RESIN. J. B. Rust and W. B. Canfield (to Montclair Research Corp. and Ellis-Foster Co.). U. S. 2,452,870, Nov. 2. An oil-soluble resin comprising the heat-reaction product of rosin and a copolymer of vinyl acetate and an alpha-unsaturated carboxylic acid ester.

MATERIAL TREATING MACHINE. M. H. Sidebotham. U. S. 2,452,959, Nov. 2. A machine for treating web material with powdered thermoplastic substances.

COATING. W. H. Butler (to Bakelite Corp.). U. S. 2,452,992, Nov. 2. Coating composition comprising the reaction product of a fatty drying oil with a polyhydric alcohol ester of a cyclopentadiene-maleic adduct.

CELLULAR THERMOPLASTIC. L. E. Daly and J. F. Schott (to U. S. Rubber Co.). U. S. 2,452,999, Nov. 2. Method of making a hard, tough, elastic thermoplastic receptacle comprising mixing rubber with cyclized rubber or a synthetic rubber, a vulcanizing agent and a chemical blowing agent, sheeting the mix, heating to partially vulcanize the mass and form cells throughout the mass.

RESINS. A. K. Scribner and F. W. Wilder (to Phillips Petroleum Co.). U. S. 2,453,039, Nov. 2. A sulfur dioxide-olefin resin made in powdered form without grinding.

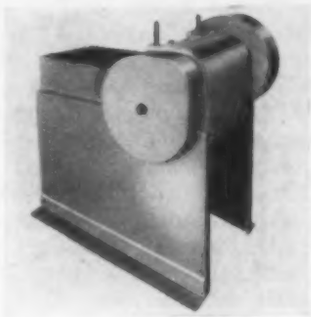
COATINGS. H. A. Van Etten (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,453,052, Nov. 2. A supple stratified film comprising two layers of polyvinyl chloride plasticized respectively with polypropylene glycol sebacate and chlorinated paraffin.

THIOPHENE-ALDEHYDE RESINS. P. D. Caesar and A. N. Sachanen (to Socony-Vacuum Oil Co., Inc.). U. S. 2,453,085-6, Nov. 2. Reacting thiophene with an aldehyde in the presence of sulfuric acid.

EXTRUSION. F. E. Dulmage (to Dow Chemical Co.). U. S. 2,453,088, Nov. 2. A mixing torpedo for plastics extruders.

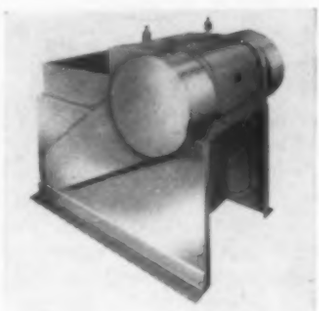
Cumberland Machines for the Plastics Industry

New!



CUMBERLAND ROTARY CHOPPING MACHINE

This machine cuts slab material from compounding mills, chops continuously extruded rods, sheets or stands, and cuts up calender roll side shear strips. This machine is also used in conjunction with extrusion machines to produce cube or pellet material suitable for a molding compound.

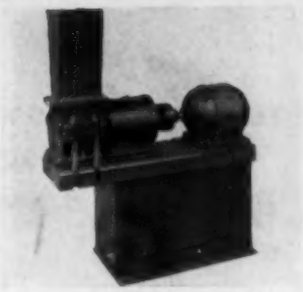


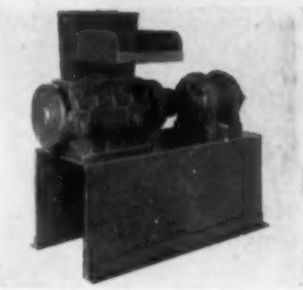
CUMBERLAND SLITTING & MANGLING MACHINE

This machine is useful primarily to manufacturers who compound plastic materials. The machine may be used to reduce material for use as a commercial product without further granulating. Or it may be used to prepare material for subsequent final reduction in a granulating machine.

CUMBERLAND PLASTICS GRANULATING MACHINES

These machines are designed especially for plastics. They perform with high efficiency the special cutting requirements of plastic materials. They are simple in design, rugged in construction and are easy to dismantle and clean. These machines are built in two styles. Nos. 0, ½ and 1½ as at top right (No. ½ is illustrated). Also, large 18" machine, double hung, with retractable knife block for complete accessibility. (Illustrated at right below.)





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Slitting and Mangling Machine .....No. 300
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BOOKS AND BOOKLETS

Write for these publications to the companies listed. Unless otherwise specified, they will be sent gratis to executives who request them on business stationery

"The Coming Age of Wood," by Egon Glesinger.

Published by Simon and Schuster, Inc., 1230 Sixth Ave., New York 20, N. Y. Price $3.50. 279 pages.

The importance of wood and the role that it plays in our everyday life is dramatically presented in simple, direct fashion. The author points out the industrial prosperity and wealth that can come as a result of utilizing wood waste. Part I presents the problem of wood waste, gives its history, and shows how the goals of plenty for all can be achieved through a program of reforestation. Part II consists of a graphic exposition of the technical aspects of the problem. Part III presents the technical problems and offers suggestions for the proper utilization of wood.

"Industrial Hygiene and Toxicology, Volume I," edited by Frank A. Patty.

Published by Interscience Publishers, Inc., 215 Fourth Ave., New York 3, N. Y. Price $10.00. 531 pages.

A compilation of reports by medical men and scientists, this thorough-going text throws considerable light upon the whole broad subject of industrial medicine and industrial relations. The object of the book is to present industrial hygiene and toxicology in simple, understandable terms and in sufficient detail to be of use to persons interested in safeguarding the health and welfare of working people and improving their working conditions.

Transparent strippable protective coatings—The use of strippable protective coatings, generally applied by dipping the article to be protected into a molten solution, is the subject of this 4-page pamphlet. One of these coatings, made from a cellulose acetate butyrate-solvent composition, and intended primarily for use on metal articles to prevent rust or handling damages, is specifically described. Included in the pamphlet is a description of the uses for the strippable coating, a suggested formula for manufacturing the coating, a description of the equipment required for the dipping process, an explanation of how to prepare the dip, and an outline of the dipping process. *Tennessee Eastman Corp., Kingsport, Tenn.*

Precision builds an industry—The achievement of holding to a tolerance of 0.0001 in. in molding a polystyrene harmonica was first performed by Finn H. Magnus. This 24-page booklet tells his story and describes his product, plant, services, and equipment. The main part of the text consists of editorial and advertising comments in such media as technical publications, consumer magazines, and nationally circulated newspapers. *Magnus Harmonica Corp., 439 Frelinghuysen Ave., Newark 5, N. J.*

1949 Modern Packaging Encyclopedia—Designed as the "how-to-do-it" book for packagers in every type of business, this 990-page encyclopedia is arranged in nine major sections which cover every step in the planning and production of successful packages. Beginning with five separate indexes, the volume proceeds with a discussion of packaging in specialized fields. Next is a treatment of packaging planning fundamentals. The fourth section contains an analysis of the materials of packaging. The next four sections include discussions on packaging forms, machinery and equipment for the package production line, shipping containers, and packaging displays. The last section is a 90-page buyers directory. This directory contains information on where to buy materials and supplies, containers, machinery and equipment, and services. Also included is an alphabetical list of manufacturers and their addresses. Available for $6.50 in the U. S., $9.00 in Canada, and $11.00 elsewhere from *Breskin Publishing Co., 122 E. 42nd St., New York 17, N. Y., attention: Mr. P. W. Muller.*

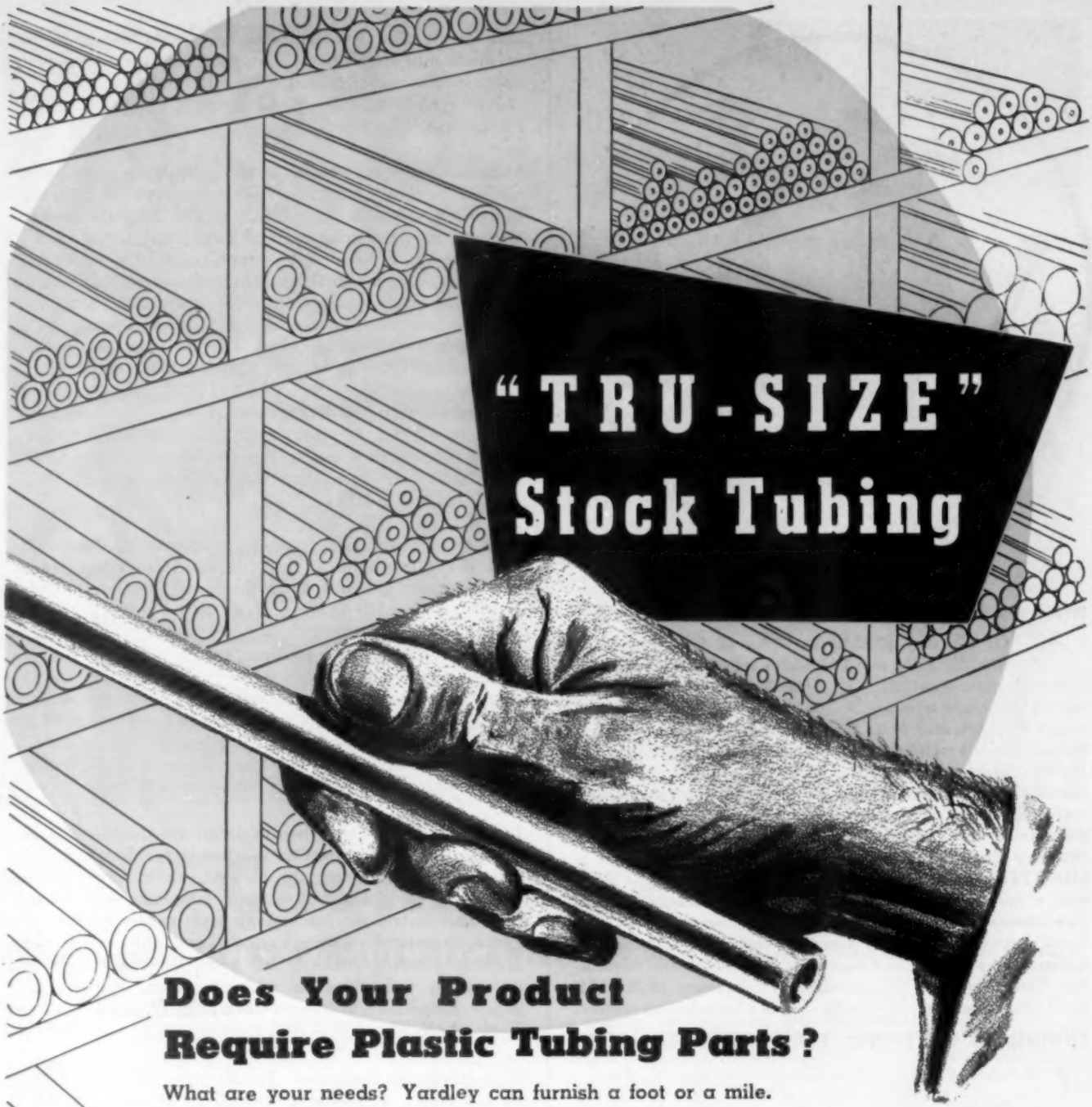
Proceedings of the Forest Products Research Society—Technical papers and discussions presented at the second national meeting of the Society are contained in this 495-page book. Included are such subjects as improved utilization of wood, chemical conversion of wood waste, mechanical conversion of wood waste and manufacture of fiber products, bark removal and utilization, coordination of research in the field of forest products, finishes for furniture, woodworking equipment, and dielectric heating. Also given is a geographical and alphabetical directory of members of the Society. Non-members of the Society may purchase this book for $8.00 by writing to *Charles E. Van Hagan, secretary-treasurer, Forest Products Research Society, Box 2010 University Station, Madison 5, Wis.*

Thermocouples and pyrometer accessories (Bulletin P1238)—Detailed information on thermocouples, protection tubes, and other pyrometer accessories is presented in this 56-page booklet. Included is a technical section that contains engineering data on things that every user of pyrometers should know about selecting the right thermocouple and protection tube for every application. *The Bristol Co., Waterbury 91, Conn.*

Taylor guide to correct instrument selection (Bulletin 98170)—The companies' complete industrial instrument line, the field of application for each type of instrument, the principle of operation, and the range limit for each instrument are presented in this revised edition. Illustrations are used throughout the booklet to show the different types of instruments and their applications. *The Taylor Instrument Companies, Box 110, Rochester 1, N. Y.*

Stauffer chemicals—The properties, grades, analyses, principal uses, packing, shipping regulations, and stocks of all of the company's chemicals are described in this 108-page booklet. Also included are Baume tables, dilution formulas, equivalents, general data, and miscellaneous tables for ready reference. *Stauffer Chemical Co., 420 Lexington Ave., New York 17, N. Y.*

Geon polyvinyl materials—A summary of the Geon polyvinyl chloride materials is contained in this four-page chart. Included are the varieties of resins, plastics,



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and latices that are available, suggested compounding methods and ingredients that may be used, processing suggestions, and finished products that are available. *Advertising Dept., B. F. Goodrich Chemical Co., 324 Rose Bldg., Cleveland, Ohio.*

Maintenance men look at housing design—Recommendations for the design and construction of low-rent housing projects is the subject of this 28-page booklet. General recommendations and details are given on site selection, site development, structures, central and group heating, tenant-operated heating, plumbing and sanitation, electrical systems, interior painting, centralized maintenance facilities, and dwelling equipment. The booklet is available for $1.00. *The National Association of Housing Officials, 1313 E. 60th St., Chicago 37, Ill.*

Surface activity and detergency—This folder covers new services offered by the company, consulting chemists and engineers, as a result of recent developments in the field of surface chemistry. *Foster D. Snell, Inc., 29 W. 15th St., New York 11, N. Y.*

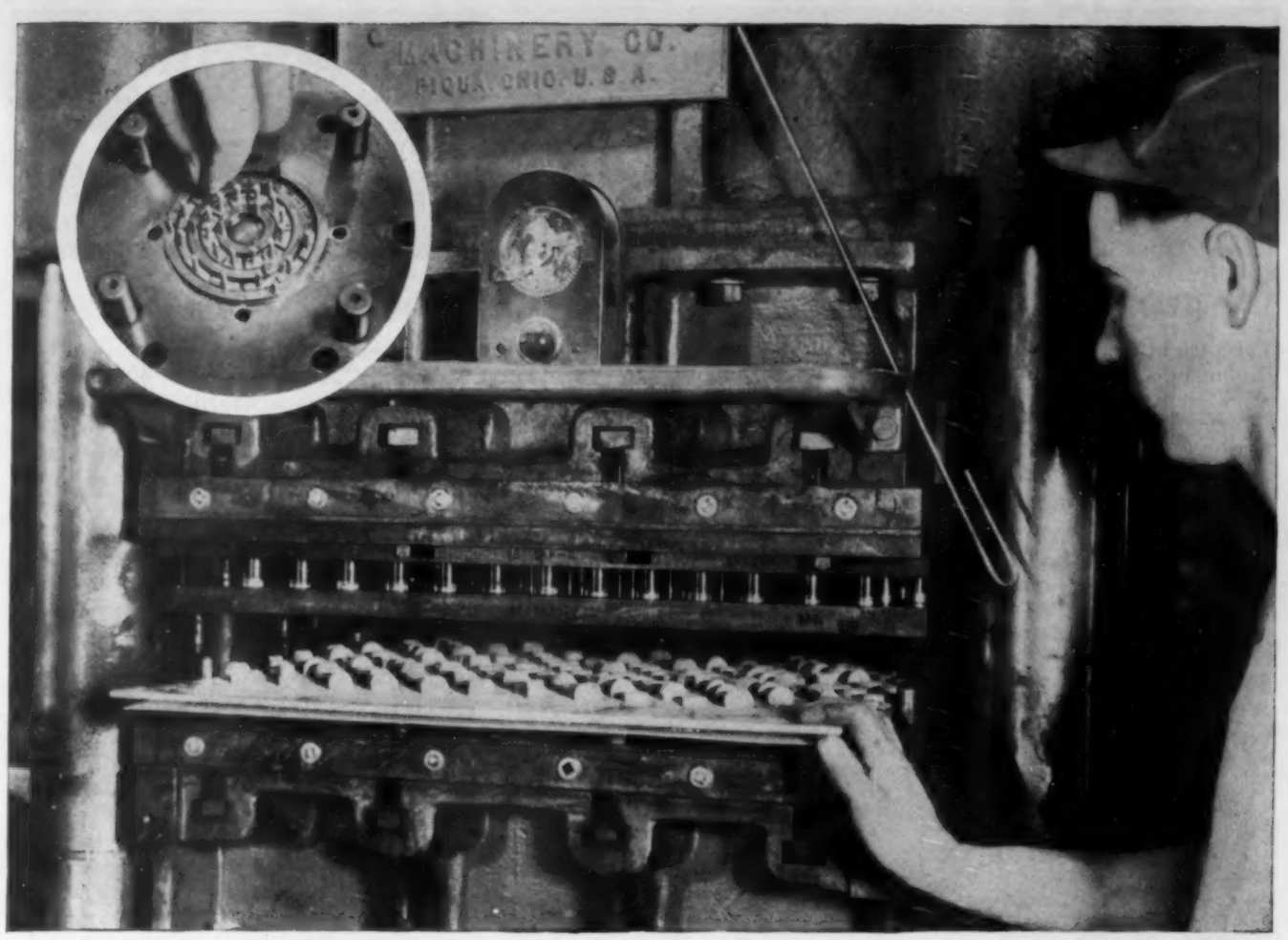
Huppert revolutionizes small furnace design and efficiency—This brochure illustrates and describes five of the company's small stainless steel furnaces. *Boder Scientific Co., 719 Liberty Ave., Pittsburgh 22, Pa.*

1949 directory of occupational safety posters—The 744 posters illustrated in this booklet are directed toward shaping worker attitudes. These posters, which will be available for purchase during this year, are designed for use in various industries and the occupations related to those industries. *National Safety Council, 20 N. Wacker Drive, Chicago 6, Ill.*

Let's look it up—Described in detail are the latest books in the fields of agricultural chemistry; biochemistry; chemical engineering; industrial chemistry; colloid chemistry; drugs and medicine; fats, oils, and waxes; food and nutrition; metallurgy and metalworking; organic chemistry; paint, varnish, and ink; petroleum; physics; plastics, rubber, and gums; textiles; and such processing industries as cement, glass, leather, and paper. *Reinhold Publishing Corp., 330 W. 42nd St., New York 18, N. Y.*

New colors for Kalistron—Twelve new colors for Kalistron, a wall covering and furniture upholstery material, are announced in this brochure-color card. In addition to the new colors, 29 colors and textures are illustrated. *United States Plywood Corp., 55 W. 44th St., New York, N. Y.*

DC 200 silicone fluids, Dow Corning silicone notebook, fluid series No. 3—This 30-page booklet deals with the properties and behavior of the DC 200 silicone fluids which are useful as damping and hydraulic media, liquid dielectrics, special purpose lubricants or additives, and as impregnants or coatings. The two-color booklet presents the chemical structure, applications, general properties, boiling and freezing points, volatility and vapor pressure, stability, viscosity-temperature relation, oxidation resistance, heat and flame resistance, water repellency, dielectric properties, solubility, lubricity, surface tension, thermal conductivity, compressibility, light and sound transmission, and physiological characteristics of the silicone fluids. The booklet is supplemented by many illustrations, charts, and diagrams. *Dow Corning Corp., Midland, Mich.*



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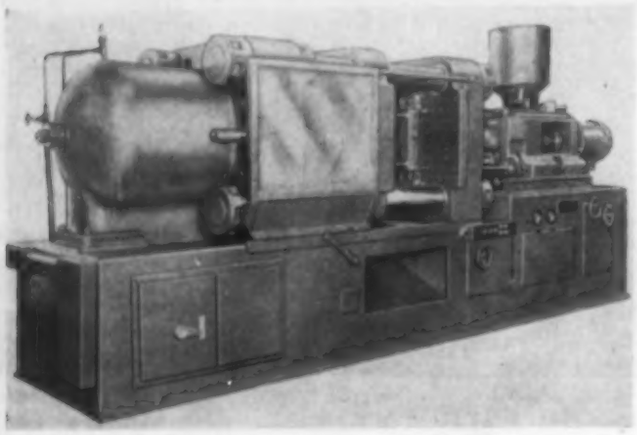
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NEW MACHINERY AND EQUIPMENT

Forty-eight oz. injection molding machine—Watson-Stillman Co., Roselle, N. J., announces a standard single-shot automatic 48-oz. injection molding machine provided with an automatic stuffing arrangement which is said to increase the rated capacity by 40 to 50 percent. Its heating cylinder is designed to delivery near-capacity shots of such "derating" materials as polystyrene, without stuffing. The electrically controlled material feed is



self-compensating. Both injection plunger and clamp ram have speed and pressure adjustments. Automatic slow-down and slow-break are provided for the fast approach and return travel of the clamp. The stainless steel hopper receives a barrel of plastic and processes it at the rate of 200 lb. per hour. Specifications include: Maximum feed, 165 cu. in.; injection pressure, 21,000 p.s.i.; clamping capacity, 1000 tons; daylight opening, 54 in.; minimum die thickness, 12 in.; maximum die sizes, 30 by 50 in.; motor, 60 hp.; oil reservoir capacity, 300 gallons.

Multiple driller—For drilling of phenolic and other forms of high and low density composition materials, B. M. Root Co., York, Pa., offers F398, a multiple driller. This machine is available with four drilling area capacities: 3 ft. 6 in. by 12 in.; 4 ft. 6 in. by 12 in.; 5 ft. 6 in. by 12 in.; and 6 ft. 6 in. by 12 in., with 11, 14, 18, and 22 spindles respectively. Spindles can be adjusted anywhere over the table area for drilling any desired pattern of regularly or irregularly spaced holes. A variable speed spindle drive with a range of 550 to 2500 r.p.m. allows different spindle speeds for drilling different size holes in materials of varying density. The feed is either automatic continuous or intermittent and any desired number of table strokes up to 30 can be obtained. Foot treadles control the feed movement of the table.

Valves—Emmett Machine & Mfg., Inc., 2249-29 14th St., S.W., Akron 14, Ohio, announces a line of diaphragm-actuated two-pressure Merit valves for high pressure hydraulic service. The valves range in size from 1 to 4 in. and can be furnished for operation on systems having 3000, 5000, and 10,000 p.s.i. pressures. Variations of valve assembly provide for 1) diaphragm-controlled high-pressure inlet, 2) diaphragm-controlled slow-travel valve, or 3) diaphragm-controlled stop valve. All are handled within one casting and with minimum pipe connections. More than 50% of the interior working parts of a valve in this series will interchange with other size valves in the same series. Seat rings can be reversed, and the need for gaskets as pressure seals on cap ends is avoided.

Buffing and polishing machine—Standard Electrical Tool Co., 2470 W. Sixth St., Cincinnati 4, Ohio, offers a self-contained belted motor driven Cadet buffer-polisher. This polisher has a standard spindle speed of 2400 r.p.m. A ball bearing motor mounted on adjustable base is inside the pedestal. Power is transmitted to the work spindle through a multiple V-belt drive. A shaft lock and hand brake are optional. Other single or double spindle speeds are available.

Electric heat transfer system—For use in processing plastics, chemicals, and rubber, for coating paper and fabrics, and for controlling temperatures in plastic extruders, rolls, pans, supply and mixing tanks, etc., Gerin Mfg. Co., Inc., 683 Broadway, Newark 4, N. J., has introduced an electrically heated circulating heat transfer oil system. It employs an oil suitable for temperatures to 600° F. An oil covering on the entire heater surface is assured by a vapor release trap which continuously removes vapors formed as the oil passes over the surfaces. This trap also eliminates water and air. Small height fins provide an effective heating area of low watt density with high velocity oil flow. Vaporization and spot overheating are said to be reduced by delivery of the oil from the pump to the lower part of the heater where it is distributed evenly under pressure. Other features include an expansion tank arrangement which prevents contact of hot oil with air, dual temperature controls, and a heater shut-off.

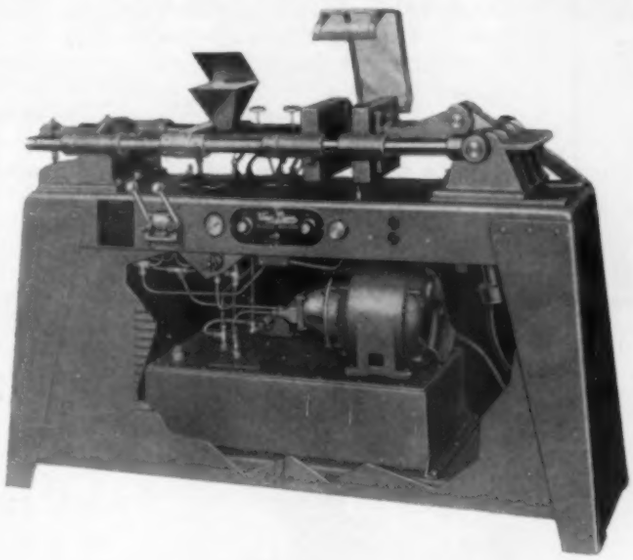
Granulator—Model G-100 grinder, designed primarily for grinding rigid thermoplastic scrap, has been added to the line of plastic machinery produced by Van Dorn Iron Works Co., 2685 E. 79th St., Cleveland 4, Ohio. It has a capacity up to 50 lb. per hr., depending upon the type and size of material. The hopper throat opening is 3 by 3⅝ inches. Measuring 36 by 20 by 48 in., the grinder is of welded all-steel construction. The one-piece alloy steel rotor is ball-bearing mounted and coupled directly to the motor. Three of the alloy steel knives revolve while the other two are stationary and adjustable. Chute and hopper openings are hinged to facilitate cleaning. The motor is 1 hp., 1800 r.p.m., 220-440 volt, 3-phase, 60 cycle AC. (*Please turn to page* 126)



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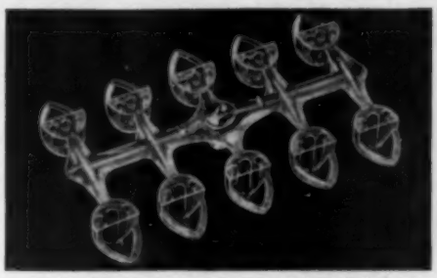


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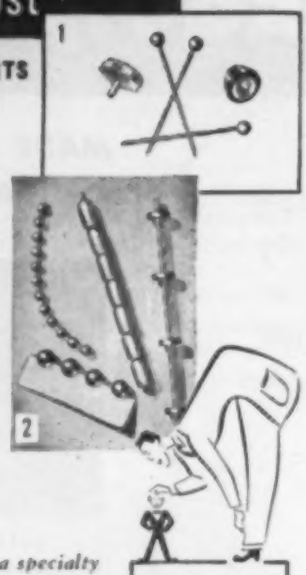
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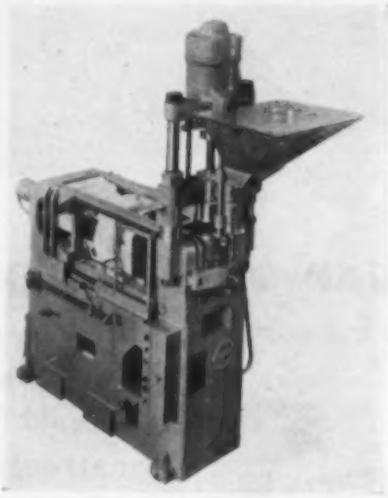
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Reverse mold stamps—M. E. Cunningham Co., 50 E. Carson St., Pittsburgh, Pa., is marketing a new range of S-T-M safety stamps for reproducing raised letters and figures on plastic, glass, or rubber products. Made from Mecco safety steel with 30° bevel characters, these stamps are said to produce extra-deep, clear-cut stamping in metal molds for reproduction of precisely formed characters on finished molded products. Character sizes range from 1/32 through 1/2 in.; all stamps from 1/16 in. up may be obtained in condensed, medium, and extended widths. Special designs and trademark dies in the same style engraving are also available.

Dust collector—A small portable dust collector, Model 335 Dustkop, designed for continuous dust collecting work on production operations is being produced by Aget-Petroit Co., Main at Washington, Ann Arbor, Mich. A self-clearing paddle wheel powered by a ¼ hp., 3450 r.p.m. motor picks up dust-laden air from the source of dust. After passing through the fan, dust is diverted over the surface of the dust collecting tray which consists of a series of baffles for separating out the lint, chips, and heavier dusts. Before air is returned to the working space, it goes through a filter of non-inflammable spun glass. This filter forms the top of the collector. Measuring 12 by 14 by 18 in., the collector can quickly be placed where desired and connected to a machine by means of a flexible hose.

Four-oz. injection molding machine—A 4-oz. injection molding machine, L½, which requires no extra parts for molding nylon is being manufactured by Lester-Phoenix, Inc., 2711 Church Ave., Cleveland 13, Ohio. A maximum of 500 shots per hr. is possible, varying with the type of product. Other specifications include: Maximum total pressure on injection plunger, 53,500 lb.; stroke of plunger, 6⅝ in.; speed of plunger, 160 in. per min.; time required to complete injection of maximum capacity, 1.97 sec.; size of die plates 13 by 18 in.; maximum die space, 10 in.; minimum die space, 7 in.; capacity of feed hopper, 40 lb.; motor required, 10 hp., 3-phase, 60-cycle, 220/440 volt, 1200 r.p.m.



Valve—For manufacturers who plan conversion of semi-automatic and manually operated hydraulic equipment actuated by low and high pressure accumulator systems, Saval, Inc., 1915 E. 51st St., Los Angeles 11, Calif., has designed an electrically operated dual pressure selector valve. Direct solenoid actuation of the valve eliminates pilot lines and permits fast operation. Although designed specifically for water pressure up to 7000 p.s.i., this valve can also be used on oil or air. It will take screwed, welded, or flanged connections up to 2 in. on pressure ports and 2½ in. on the return port.

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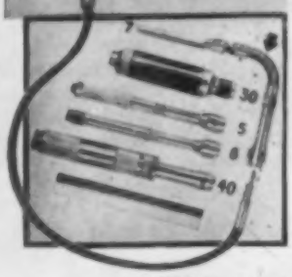
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Please send us your catalog N-3816 showing the different uses of Foredom Flexible Shaft Machines.

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WHAT'S NEW IN AUBURN Plastics



SELF-HINGED BOX. A new and completely different kind of package is molded by AUBURN to hold the parts of a button-hole attachment made by the Greist Mfg. Co., New Haven, Conn., for the Singer Sewing Machine Company.

Developed by AUBURN and designed by Egmont Arens, it is injection molded of polyethylene as one self-hinged unit. The "built-in" hinge gives a spring action when opening and closing the box . . . has been tested up to 70,000 openings and closings without appreciable wear.

Inherent advantages of the new box provide a wide range of packaging applications. It is soft . . . protects stored parts against damage. It is pleasing to see and feel . . . can be grained to simulate leather or given any other surface design . . . easy to clean and keep clean. Has unlimited possibilities as a re-use package!

• • •



CLARINET CASE. An improved type of reinforced plastic gives increased utility and durability to the clarinet case molded by AUBURN for the Komold Case Co. of Philadelphia.

The new material is made of sisal fibre bats with a binder of polyester resin. It gives the case an impact strength of 10 foot lbs. (Izod) . . . Fiberglas, decorative papers and other combinations can be employed. Abrasion resistance, light weight and unusual pleasing appearance are among its other advantages.

AUBURN research engineers have just completed the development and final testing of this new reinforced plastic which has special applications for housings, covers, and other shapes with compound curvatures where weight-strength ratio is important . . . and where wall thickness is uniform

AUBURN molds all types of plastics by any modern molding method. When you have a problem in plastics, AUBURN'S 73 years of experience is at your service. Write: Auburn Button Works, Inc., 600 McMaster St., Auburn, N. Y.

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Formica can be machined, punched, turned, milled, drilled, threaded, stamped and postformed. Whatever your needs, you'll find that Formica makes the grade that "makes the grade". Have *your engineers* get in touch with *our engineers*, today . . . via mail, wire, phone!

Write today: FORMICA, 4531 Spring Grove Ave., Cincinnati 32, O.

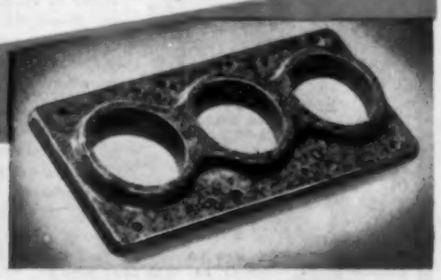
Productive FORMICA Reg. U. S. Pat. Off. at Work in Industry



Mechanical: *Formica engineers added ribs in staggered sequence on aircraft pulleys, doubling their strength.*



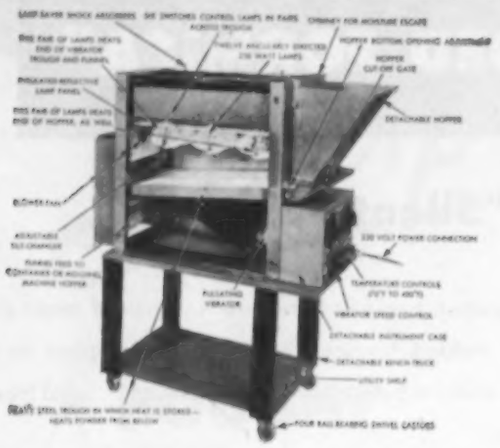
Chemical: *Formica parts used in the H. W. Butterworth & Sons Co. rayon spinning machines are unharmed by acid setting solutions.*



Electrical: *Allis-Chalmers Manufacturing Co. relies on Formica for reliable insulator support in its metal-clad switchgear.*

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PLAIN TYPE PLUGS FOR N.P.T. PIPE THREADS

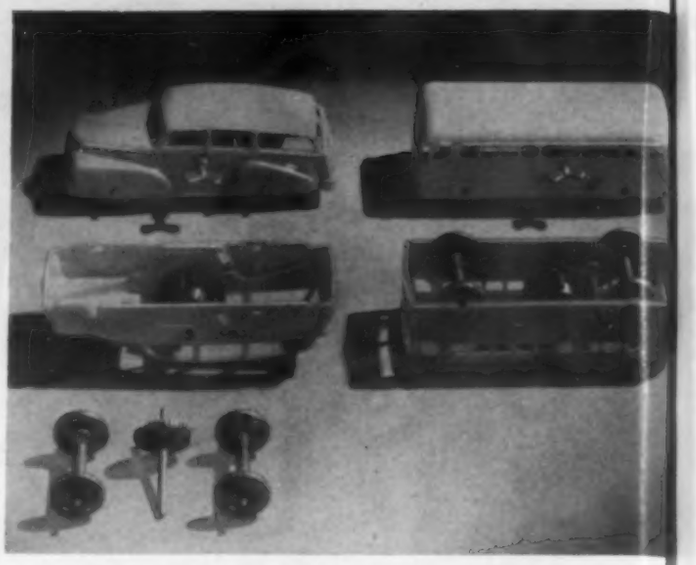
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Driving power in these toys is supplied by a coil spring to an acetate drive shaft, connecting gear, and axle

Toys with Plastic 'Motors'

MOLDED plastic gears are used in the "motor" of a new wind-up toy believed to be the lowest priced quality wind-up ever marketed in this country. The toy, manufactured by Nosco Plastics, Erie, Pa., is made of polystyrene and cellulose acetate.

The only non-plastic part in the assembly is the coiled wire spring which supplies the motive power. All the working parts are molded of gun-metal colored Tenite cellulose acetate. The same internal parts are used with either of two polystyrene housings to make either a bus or a station wagon.

The "motor" consists of three acetate units: a central drive shaft, a rear axle assembly, and a connecting gear. The wire coil spring is wound around the central drive shaft, and one end of the spring is secured to the housing. From the central drive shaft, the motive power is transmitted to a connecting gear which, in turn, transmits it to the rear axle.

An unusual arrangement of the connecting gear allows the rear axle to free-wheel when it is not being driven by the spring. Instead of being held in place by ordinary holes in the housing, as are the other turning parts, the shaft of the connecting gear is hung in diagonal slots. When the spring is wound, the pressure of the main shaft pushes the connecting gear to the top of the diagonal slots and causes it to mesh with the rear axle.

When the mainspring is not exerting any pressure on the connecting gear, it drops to the bottom of the diagonal slots, and ceases to engage the gears of the rear axle. The toy thus will run over 30 ft. on one winding, according to the manufacturer.



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An exclusive die-making technique developed by Zenith Plastics, enables us to mass produce low pressure laminated shapes for the first time, by almost completely automatic operations, without the extensive use of costly hand labor. Hence, Zenith laminates far undersell drawn metals (often by as much as 60%). The window frame illustrated is typical. Tolerances so close are achieved in these laminates, that precision fits present no difficulty.

Colors and designs can be imbedded in the laminates. It takes the most abusive type of scratching or abrasion to harm them. And for many applications, painting can be dispensed with entirely. In addition, Zenith low pressure laminates can be prepared with excellent flexural and dielectric strength.

Take a cue from leading aircraft manufacturers — Douglas, Lockheed, Consolidated, Republic and others — for whom Zenith designs, engineers and supplies mass produced, low pressure laminated shapes. Check into the advantages of Zenith laminates for *your* particular needs.

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Here are typical applications where Zenith low pressure laminates can be used effectively, at great savings.



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Attractive three-dimensional displays are made by casting phenolic or phenolic mixed with plaster in flexible molds

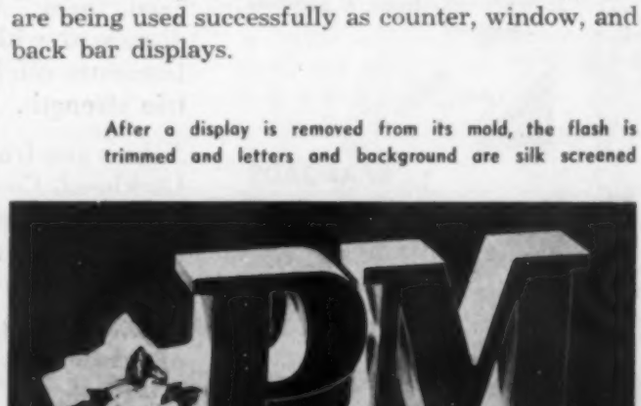
Phenolic-Gypsum Signs

TWO types of plastic three-dimensional display signs, both cast in plastic molds, are being manufactured by Elrae Plastic Co., Los Angeles 26, Calif. The more expensive displays are cast of Plastitool phenolic resin; the less costly ones of phenolic resin combined with gypsum.

Elrae first considered fabricating these signs but this method proved too expensive and failed to give the painstaking detail desired. Production procedures for the two types of displays are the same. After art work for a proposed display is approved, a master model is made in carving plaster. Plastiflex, a flexible mold material, is then poured over the model, making a female mold. Plastitool and Plastiflex are made by Calresin Corp., Culver City, Calif.

Resin, or a mixture of resin and gypsum is then poured into the mold and cured at 175°. Castings are next taken from the molds, flash removed, and lettering and background colored by silk screening. The finished products are colorful and sturdy, and are being used successfully as counter, window, and back bar displays.

After a display is removed from its mold, the flash is trimmed and letters and background are silk screened



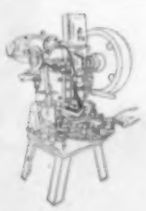

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Above is an illustration of a high production hot stamping and color embossing machine that puts the name on plastic parts and enameled wood stamp handles

This is the ACROMARK Model No. 9AHS Motor Driven, electrically heated and thermostatic controlled machine and it is widely adaptable to the marking of molded or fabricated plastic products.

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The ACROMARK Company

Record Eraser

SOUND grooves on vinyl disks used for dictation and business recording may now be erased and the disk made ready for reuse in 29 seconds. This erasure, which enables a record to be used 25 times or more, is accomplished by means of the SoundEraser, a compact portable-radio size machine developed by The SoundScriber Corp., for use with the disks employed in its recording equipment.

The key to the process lies in the Vinylite plastic material used in the disks. During recording the plastic is not removed by the diamond stylus; it is merely "plowed up". As vinyl has a tendency to return to its original shape, it was simply necessary to find a method of accelerating this return.

Disks inserted in the SoundEraser are spun while being heated by infra-red rays. The centrifugal force of the spinning operation on the hot plastic erases grooves and leaves both surfaces smooth.

With this machine, plastic disks have a recording life of 13 hr. as compared to 6⅔ hr. for a wax cylinder. Cost of the records to the user is said to be reduced 75 percent.

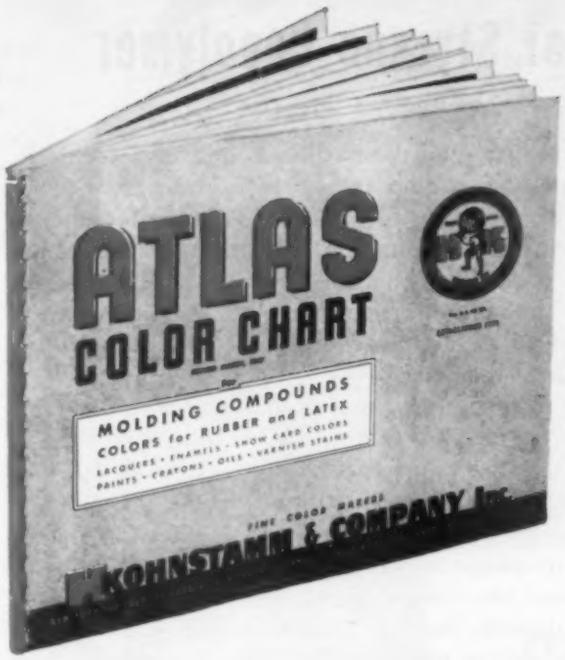
SoundErasers are being leased by 200 of the company's dealers and distributors to large users on a 15 and 30 day basis. Smaller users can take accumulated used disks to company service centers for erasure at a nominal cost.

If it is necessary to keep excerpts from disks for future reference, such portions may be copied onto a smaller record.

New machine simultaneously spins and heats used vinyl records, eliminates sound grooves in about 29 seconds



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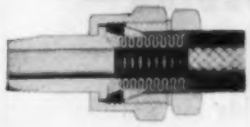
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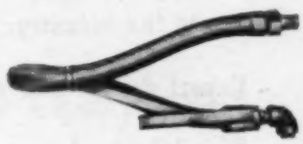
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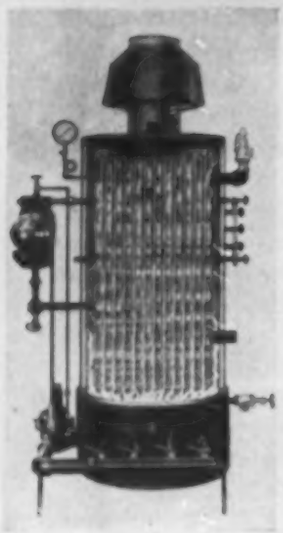
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Pencil Sharpener Housing of Styrene Copolymer

AN electric pencil sharpener housing, formerly made of cast zinc, is now being fabricated from U. S. Rubber's Royalite, a high styrene-butadiene-acrylonitrile sheet material. According to the manufacturer, Hollywood Specialty Co., Glendale 4, Calif., production costs are about the same, but a number of advantages were gained by changing to the plastic material.

The metal housing required time-consuming finishing operations; the simulated pin seal leather finish is integral in the surface of Royalite and enhances the appearance of the finished unit. The light weight of the plastic housing — 6 oz. — makes the unit easier to move from place to place in offices, and also cuts shipping costs. In addition, it is more durable for this particular use, and has certain acoustical qualities which deaden sound when the unit is in operation.

Since trade acceptance of the old design was good, no major changes were made in the new. However, the corners were rounded off to achieve more flowing lines.

Artisan Engineering Co., Los Angeles, Calif., produces the housings, using the hot press method Sheets are formed over Masonite dies.



The only difference in the shape of the former metal housing, left, and the new plastic unit lies in the corners, which were rounded off on newer model, below

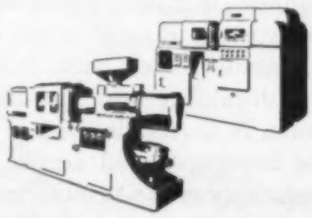




Stepped-up time cycling—a speeding-up that pays off in molding profits—is something you're bound to want to look into. The new-design Fellows-Leominster machines are just about the last word in high-speed-molding capacity. Fellows engineering is moving this line of Injection Molding equipment out in front. Every man in the market for 1949 equipment owes it to his pocket book to investigate—AND COMPARE!

Design Features that put money in the user's pocket.

- New automatic preheat of material, readies the shot for faster plasticizing.
- New clock-controlled booster for faster injection and better control.
- New built-in pyrometers for all-'round convenience.
- New super Speed-Flo cylinder design, with Taper-tite torpedo.
- New injection plunger pre-positioning to save half of injection time.
- and many other exclusive points of superiority.



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Magnetic base holds automobile light in any desired position. Plug which is inserted in cigarette lighter socket for power is polystyrene; light housing is acrylic

Auto Flare

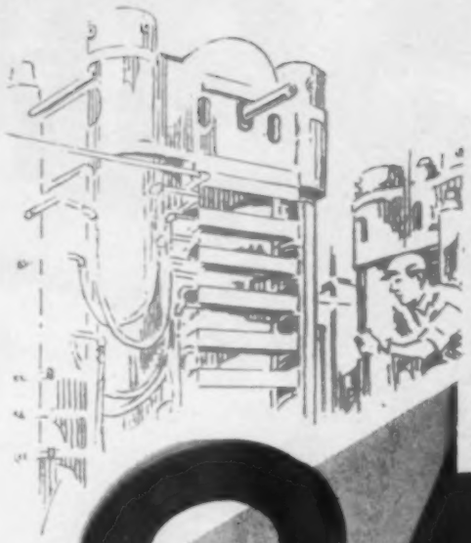
has steady light for utility use and flashing light for highway emergencies

A MOTORIST who is forced by car trouble to stop after dark on a busy highway can warn approaching cars of his presence or signal for help with Look-Out Lite. This plastic device, which is plugged into the cigarette lighter socket for power, can be switched on to give 80 red and white flashes a minute or a steady red and white light.

Outside the car, the steady light comes in handy in locating engine trouble, changing a tire, or searching for tools in the trunk compartment. Inside the car, it can be used for reading maps, etc. A permanent magnetic base causes it to adhere firmly to any metal surface on which it is placed. A 12-ft. cord permits maneuverability.

Perry Products, Inc., Kenilworth, N. J., uses polystyrene for the plug and Plexiglas for the three part housing. Acrylic was selected because of its light weight, ruggedness, and light piping characteristic—and because it easily dissipates the heat developed by the 21-candle power bulb. Polystyrene was chosen for its durability and low cost. Pyro Plastics Corp., Union, N. J., molds the top and bottom section of the housing of red acrylic and the center piece of white acrylic. It also molds the polystyrene plug which consists of identical halves cemented together.

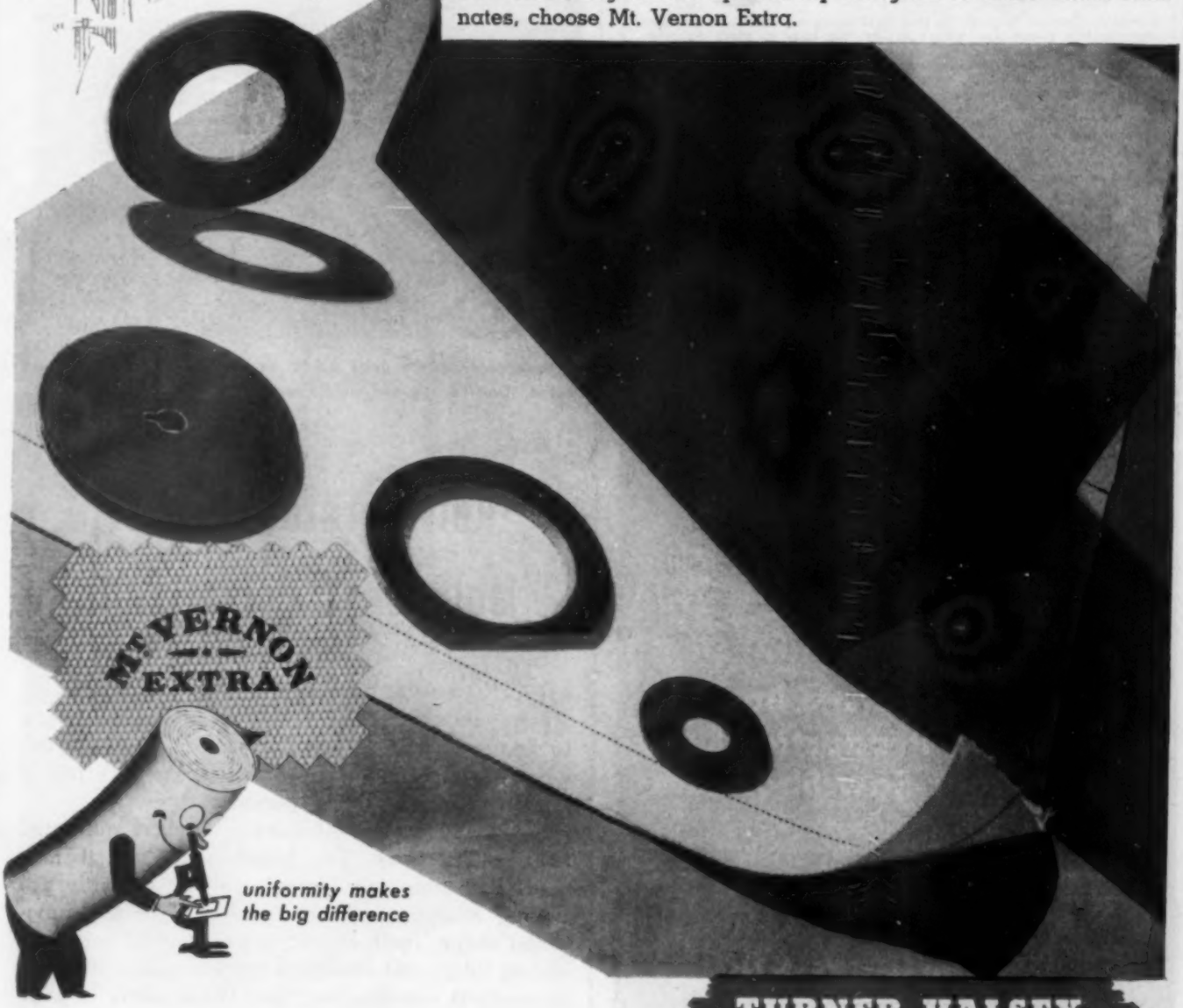
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That's why Mt. Vernon Extra gets first call in their specifications. Mt. Vernon's high degree of uniformity insures uniform resin penetration . . . because Mt. Vernon fabrics are produced from top grades of cotton under rigid laboratory controls to insure successful lamination.

For laminating fabrics specifically designed to make better laminates, choose Mt. Vernon Extra.



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For reducing high pressures in Plastics Plants — as high as 6,000 lb. per. sq. in. — this



ATLAS Type "E"

High Pressure Reducing Valve

is now well known to be the "Last Word." It handles the highest pressures with the utmost ease — *without shock* — air, oil, or water.

Complete Data on Request. In this small space we cannot adequately describe this remarkable valve. Briefly, the body is made entirely of the strongest forged steel. All of the internal metal parts are of stainless steel. A formed packing of special material superior to leather is used which is immune to all fluids commonly used in hydraulic machinery. The pressure on the seat is balanced by a piston with the result that variations in high initial pressure have little effect on the reduced pressure. And so on. If interested, ask for complete information.

For other ATLAS plastics plant products see the partial list in our ad in the January 1949 issue of MODERN PLASTICS

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Translucency permits quick check on amount of liquid in bottle. Grooved grip and molded-in spout make pouring easy



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In making the famed "Gar-Form" one-piece plastic boats, top production speed depends on DoALL High-Speed Saws. These cut wood and plastic parts on assembly lines; also slot gears, trim engine castings and rudders. There's a DoALL Saw and blades to cut any type of material. Write for literature describing economies possible in your plant.



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Des Plaines, Illinois

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WATER bottles have long plagued thirsty refrigerator looters. Scores have slipped out of hands to shatter on the kitchen floor; many seemed to require three hands to open; tops of others had a tendency to rust over a period of time.

New polystyrene refrigerator bottles, marketed by Plas-Tex Corp., Los Angeles 25, Calif., banish these and other annoyances, and consequently are finding ready consumer acceptance. Their functional shape, light weight, grooved grip, and easy sliding lid permit one hand operation. The molded-in spout is non-dripping, and the opening is wide enough for efficient cleaning.

Quart and half-gallon sizes are available in an assortment of gay translucent colors. The two parts to each bottle—body and sliding closure—are molded by Plas-Tex of Styron or Lustrex.

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Elmes molding presses are even faster, now that the lower knockout resets merely by *pressing a button!* This Elmes "first" is a valuable aid to high-speed operation. It's safe, and saves time—gives Elmes users *another plus* in profits.

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"THIS MOLD MOVED
LESS THAN .0003"
IN HEAT TREATMENT!"



Molds, made from Carpenter VEGA Tool Steel, built and operated by BEAMAN PLASTICS PRODUCTS CO. for SAWYER'S, INC., Portland, Ore.

Specifications were exacting for these large molds used to make the View-Master box which houses photographic equipment. Because the top and bottom of the box had to match perfectly, mold size change had to be held to an absolute minimum. Also, the molder wanted double assurance that every box would come through with a gleaming finish. With Carpenter *Vega*, size change was held to less than .0003"—and the finished boxes are real beauties!

For similar performance on your large molds where minimum size change is important, always specify "Carpenter Vega". THE CARPENTER STEEL CO., 112 W. BERN ST., READING, PA.

Job Statistics:

Vega was machined to 1/32" of final size; then stress relieved by heating to 1000°F, and cooling slowly. After final machining and polishing, molds were reheated to 1550°F, held at this temperature for 4 hours, then cooled in air. Drawn overnight at 400°F. Resulting hardness: Rockwell C-58.

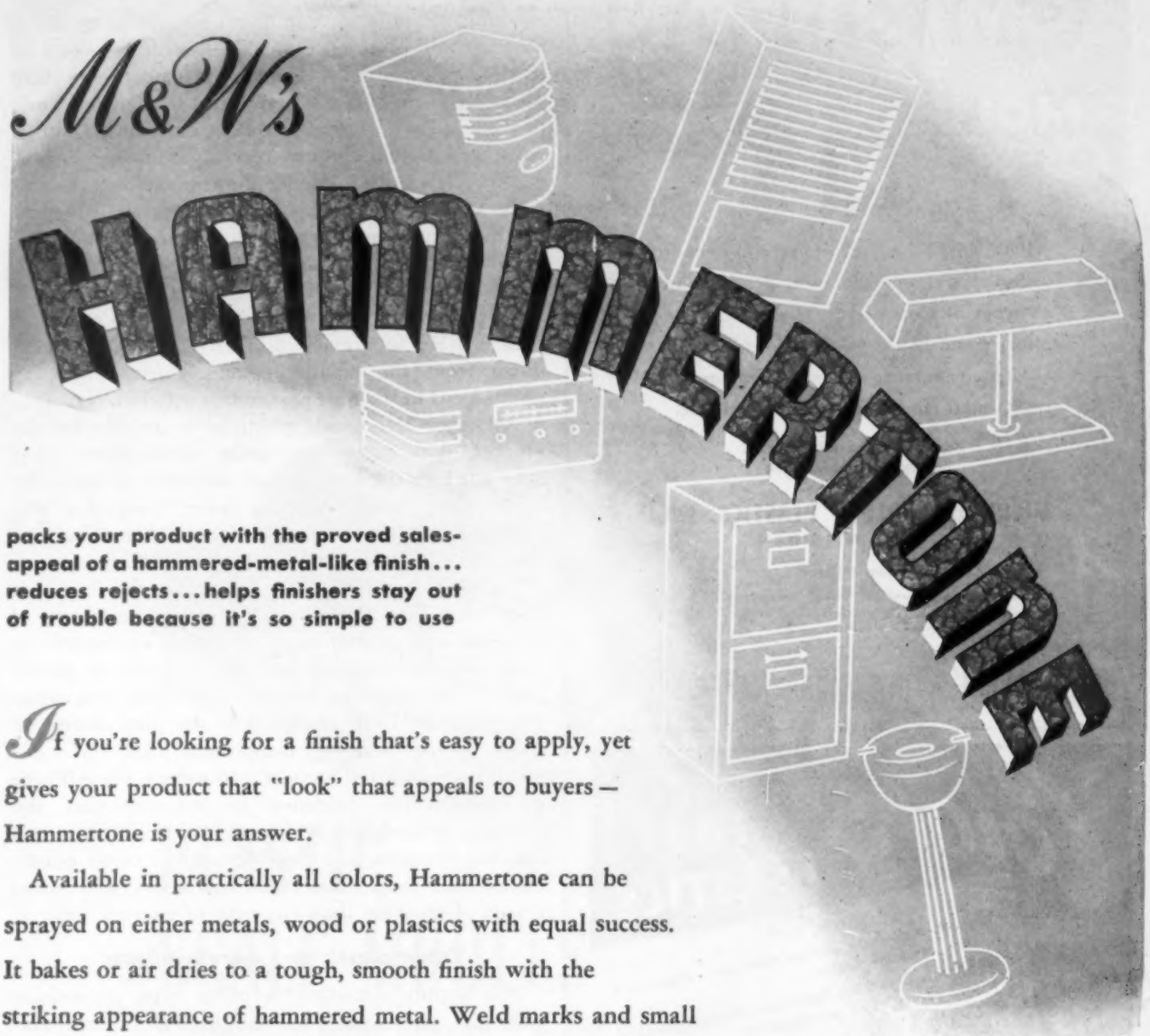
Carpenter VEGA

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Plasticizers

(*Continued from page* 82)

entering the field as manufacturers of the product. Carbide and Carbon and Ohio-Apex have been in since the beginning, and the latter is now marketing di-iso-octyl-phthalate. Tennessee Eastman has been producing DOP in small quantities for some months. American Cyanamid has recently announced production of both types under the trade names of Aero DOP and Aero DOPI. B. F. Goodrich Chemcial Co. has announced that it will start marketing DOP type plasticizers in the early Summer. Barrett, United States Industrial Chemical, and Monsanto are all on the rumor list, and there may be others.

Before Winter comes again, DOP may be snowing down from the mountain tops. Furthermore, as pointed out in the first part of this article last month, many other high grade plasticizers are now on the market, with new ones under development, that may cut into the now almost universal demand for DOP. There were doubtless many companies who started using it as a sole plasticizer when it became freely available, as Bakelite has been doing in some of its film formulations for many months; but it is significant that Carbide and Carbon, associate of Bakelite and predominant in DOP manufacture, is itself developing another type all-purpose plasticizer which it hopes will be less costly and more efficient than DOP. Today it is the plasticizer that keeps the cost of vinyl compounds high, and technicians are working earnestly to reduce price. There is considerable evidence to indicate that the phthalic anhydride and octyl alcohol shortages spurred research and development in other plasticizers that may soon result in better and lower priced plasticizers than any now in general use.

Other plasticizers more available

The supply situation in other type plasticizers than the phthalates has also turned to comparatively easy availability, in some cases for the simple reason that when DOP became more freely available, processors bought less of those which had been acting largely as extenders for DOP.

For a long time to come, however, other plasticizers will be used since blending has become an almost universal practice in order to obtain more utilitarian properties in the finished goods. The phosphates, for example, which impart fire retardance and have many other useful properties as a plasticizer, seem to be well established, and with cresol now more freely available for tricresyl phosphate, which is particularly adaptable for wire coating, floor covering, etc., there should be no shortage of that compound in the near future. Other phosphates are being rapidly developed for all-purpose uses, and Monsanto has just completed a 10,000,000-lb. plant for a new plasticizer of the



15-½" long
5-¼" wide
4" high

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Another scale model designed by Cruver for the Caterpillar Tractor Company of Peoria, Illinois.

The Number 70 Road Scraper model is in the same scale (1:24) as its companion, the D-7 Tractor.

In "Hi-Way Yellow" acetate, this replica is an example of fine molding detail and is complete even to genuine rubber tires in the same scale.

Your plastic problems, regardless of complexity, will be solved by the same staff responsible for engineering this Caterpillar scale model.

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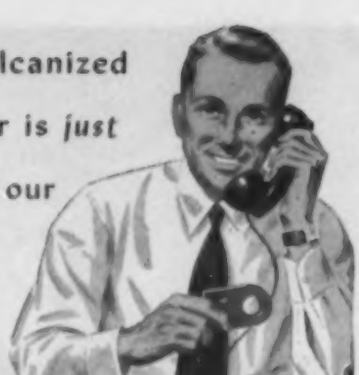
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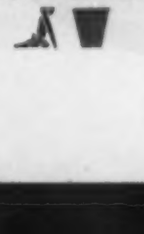
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Established in 1930

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VICTORY of CHICAGO

phosphate type. There should be no shortage of phosphate plasticizers in the near future unless greater demand should switch heavily to them instead of other types or unless the vinyl industry should increase more rapidly than expected.

The plasticizers produced from vegetable oils such as castor, palm, soya, etc., are, of course, dependent upon the supply of those oils, and that supply was exceedingly short until 1948. Since these oils are all now fairly abundant, the raw material problem seems solved for some time to come. Production will undoubtedly increase since the linear ester types of plasticizers derived from these oils or fatty acids produce qualities of hand and drape that are highly desirable, and the polymeric types, being of extremely low volatility, give permanence. Many chemical companies are now producing or at least thinking about entering this field, so processors seem assured of a wide assortment from which to choose. However, shortages will likely develop in some particular brand from time to time if it shows unusual adaptability because manufacturing facilities for these types are on a much smaller scale than for the phthalate types, and any unusual demand might tie up manufacturing facilities for a short time.

Varied uses for plasticizers

The table on page 82 shows clearly that the plasticizer business is by no means confined to vinyls, or even to plastics. In the cyclic plasticizers, only tricresyl phosphate and the item marked "all other phthalates" (which is largely DOP) are primarily for vinyls. The other phthalates are used for cellulosics, insectifuges, cellophane, lacquers and varnishes, etc. Polyvinyl butyral for safety glass sheeting has been plasticized with both dibutyl sebacate and tri-glycol dihexoate. Tricresyl phosphate has been used in coatings for cellophane and is currently in demand to give lubricants low temperature resistance and as a hydraulic fluid in die casting machines. Other plasticizers are used in zein and casein paper coatings and label varnishes. Adhesives require great quantities of dibutyl phthalate, tricresyl phosphate, and several other plasticizers. Many of the acyclic plasticizers are used for wetting agents, and one of the oleics is used in bread to keep it moist.

In considering the supply situation for plasticizers during the next few years, it will be wise to keep an eye on their uses for other things than vinyl. Several could easily expand to great proportions and upset the balance that now seems about to be established; but with all the major producers expanding their operations, and with octyl alcohol, phthalic anhydride, cresol, and vegetable oils in promised abundance for 1949 and 1950, it hardly seems likely that any great shortage will develop during these immediate years.



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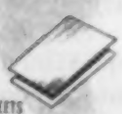
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Peroxide Catalysts

(*Continued from page* 103)

resented with active oxygen contents varying from 2.1 to 15.1 percent. Methyl isobutyl ketone peroxide in dimethyl phthalate (Lupersol FDM) and methyl amyl ketone peroxide are two new ketone peroxides which have just been made available to the trade in pilot plant quantities. It will be noted that catalysts are available in liquid, paste, powder, or granular forms. The liquid catalysts can be incorporated directly into the resin, but care should be exercised to obtain thorough mixing. Paste, powder, or granular peroxides can be premixed with a small amount of monostyrene or polyester resin from the lot to be catalyzed. The resulting thin paste is then added to the bulk of the remaining resin and mixing continued until a homogeneous resin-catalyst mixture results.

Catalyst selection

Seventeen commercially available catalysts have been classified in Table II according to properties of interest to the fabricator of polyester resins. Inspection of this table will show that individual catalysts fall into one of three groups depending upon ability to function at low, intermediate, or high temperature. The appropriate temperature group for an individual peroxide catalyst is determined in part by the peroxide decomposition rate.

Investigations were undertaken to determine the relative activities of commercial peroxide catalysts within each temperature group. Catalysts were evaluated with a representative number of polyester type resins. These studies indicated that each catalyst had an individual pattern of activity with every resin-catalyst system. Although this pattern varied somewhat between resins, the trend was sufficiently consistent to allow the establishment of the order indicated in Table II, column 1. The catalysts are arranged in order of decreasing ability to gel polyester type resins at room temperature. Hydroxyheptyl peroxide, first member in the low temperature group, would be expected to initiate the most rapid room temperature gelation of a given polyester type resin. Dibenzaldiperoxide compounded with tricresyl phosphate (Luperco ETC), appearing last in the column, would be expected to effect the slowest gelation.

The catalyst order constitutes a useful starting point in making initial selections based upon the catalyst requirements involved. There is no definite demarcation in performance between the higher catalysts of one group and the lower catalysts of the subsequent group; however, the existing gradual differences offer the fabricator wide selection.

Curing temperatures

The data under "Usual range of curing temperatures" in Table II were partially established as

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One of the most significant packaging developments in the last decade is the H & D INSULPAK*, a corrugated box in which coast-to-coast airborne shipments of pre-cooled foods are made possible—*without refrigeration*. INSULPAK now makes all America a vast potential market for seafoods of all kinds. Daily delivery of fresh, perishable foods everywhere is now accomplished by this new, insulated package. It is hoped that it will soon be available for wide-scale distribution.



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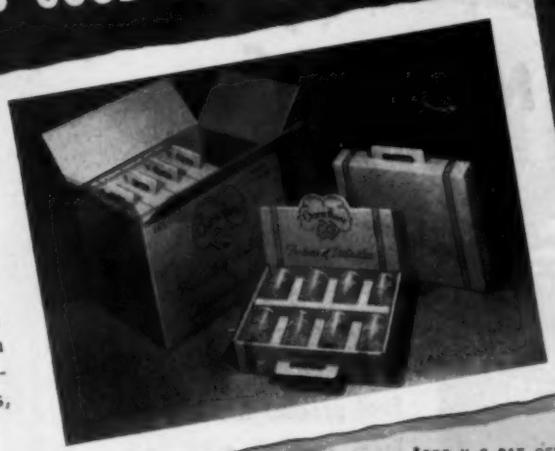
Here's the famous Duplex shipping-display box developed by H & D for those manufacturers who wish to display their products—effectively and economically—at point of sale. It's a regular corrugated shipping box which the dealer opens to form a colorful counter display with a sales message that attracts attention and makes people buy. The H & D Duplex shipping-display box protects your product in shipment—sells your product in the retail store.



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H & D PREPAK* Increases Unit of Sale

Many items, such as china and glassware, can be prepared at the factory into selling units that step up sales. Instead of selling one item at a time, Prepak* sells six, eight or twelve. Prepak promotes "take with" purchases, needs no repacking. The package illustrated contains a set of 8 glasses. It is made of light blue embossed corrugated board, printed in two colors, red and dark blue.



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a result of recent research on peroxide decomposition rate studies made by Redington.[1] This work and previous studies have indicated that the most efficient peroxide catalyst has a decomposition rate of median magnitude within the temperature ranges desired. The reactivity of the monomer in question should also be considered. For example, a peroxide having a high decomposition rate at 150° F. can be efficiently employed with many polyesters; the use of the same catalyst and a relatively unreactive monomer at this temperature may result in the thermal loss of catalyst without obtaining gelation or cure of the resin. Therefore, with relatively unreactive monomers a catalyst exhibiting a lower rate of decomposition, such as benzoyl peroxide or another peroxide from the intermediate group, should be employed.

Catalyst concentration

Resin manufacturers, in their technical literature, have recommended concentrations of the more widely known catalysts which may be used with their resins. As an approach to this problem, Patterson and Robinson[2] have stated that the concentration of catalyst used should be inversely proportional to the reactivity of the resin.

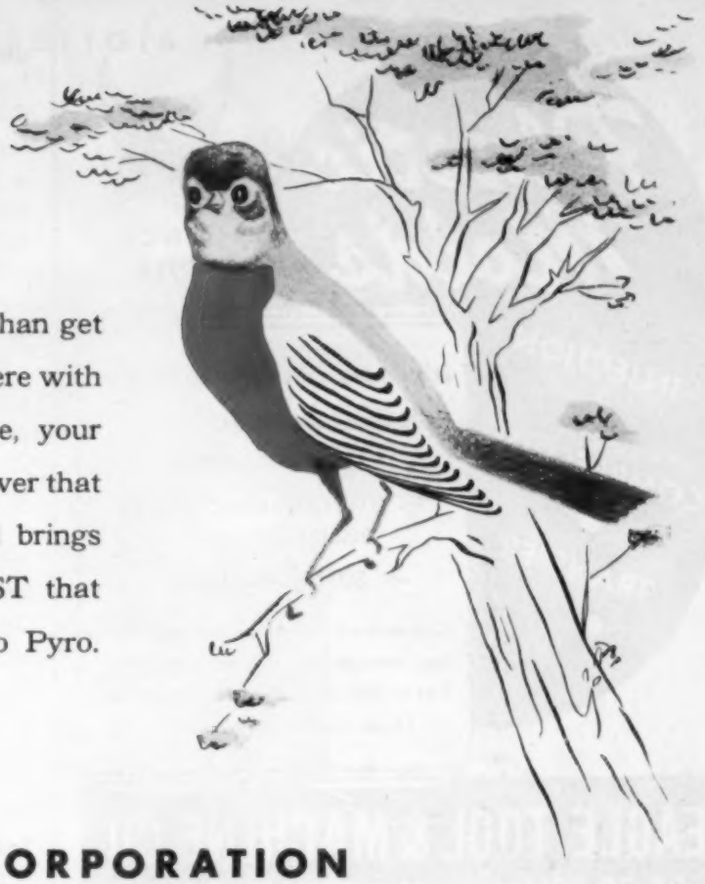
The concentrations appearing in Table II are intended to serve as a guide, especially for the newer peroxides. For laminating and molding operations, using rigid or semi-rigid resins, arbitrary concentrations have been chosen for each peroxide on an approximately equal active oxygen basis compared with 1% benzoyl peroxide. For flexible resins the basis of comparison is 2% benzoyl peroxide. With these bases of comparison it is a simple matter to adjust concentration to obtain desired modifications. Catalyst concentrations in casting are largely determined by the size and shape of the article to be fabricated; in general, articles with a large cross section require low catalyst concentrations. Changes in catalyst concentration, as previously found by other investigators, will influence cure patterns and some physical properties of the final polymer. In general, varying the concentrations of catalysts in the low temperature group will cause greater changes in curing rates and final properties than varying the concentrations of catalysts in the intermediate or high temperature groups.

Rate of initiating polymerization

The gelation time or induction period of a resin-catalyst system is dependent upon commonly known variables such as temperature, resin composition, and catalyst. Various additives in the form of promoters or inhibitors contained in or added to the resin also influence the rate of gelation. Temperature-sensitive inhibitors may function independently of the catalyst, but in most instances the inhibitor is

[1] L. E. Redington; *J. Polymer Sci., 3,* 503 (1948).
[2] D. G. Patterson and J. D. Robinson, India Rubber World *118,* 811 (1948).

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deactivated through reaction with part of the catalyst present. The interpretation of laboratory results dealing with the control of these variables often presents a problem to the fabricator. He must determine if these results are significant in terms of quality control, and if they can be duplicated under pilot or full scale conditions.

The performance of peroxide catalysts is affected by variables such as heat, light, concentration, and solvent medium. Differences in performance resulting from such variations, while detectable in the laboratory, are often narrowed under usual production conditions. Catalysts in the low temperature group when used in the concentrations specified in column 3 of Table II show similar gelation times with many polyester resins at elevated curing temperatures. Catalysts in the intermediate and high temperature groups do not necessarily follow this pattern. The group difference is one of degree, based in part upon peroxide decomposition rates which become successively lower as we progress from low to high temperature catalysts. With some flexible or extended rigid type resins which contain relatively large amounts of monostyrene there will be a change in the order of activity of the catalysts as listed in Table II, column 1. With these resins the first members of the low temperature group may fail to initiate gelation of the resin within a reasonable length of time even at curing temperatures above 150° F. The higher members of this group or those in the intermediate or high temperature groups will function as efficient catalysts where large amounts of styrene are present.

Tank life of resin-catalyst systems

Tank life, as it is generally understood, is a measure of activity of resin-catalyst combinations at room temperature. The tank life of a resin-catalyst system depends upon resin activity, rate of decomposition of the catalyst at room temperature, catalyst concentration, and daily or seasonal variations in room temperature. The intermediate and high temperature group catalysts are evidently better than low temperature catalysts in terms of affording long tank life to a resin-catalyst system. It is possible to use a catalyst mixture to obtain prolonged tank life without undue sacrifice in reactivity of the prepared resin at normal mold or oven temperatures. Perhaps temperature-sensitive inhibitors which are not deactivated by peroxide catalysts constitute the best approach to prolonging tank life of resin-catalyst systems.

Physical properties of finished polymers

Little is known at present about the specific influence of various catalysts on the physical properties of finished polymers. Catalysts may affect crazing as well as aging, hardness, and toughness prop-

(*Turn to page* 157)

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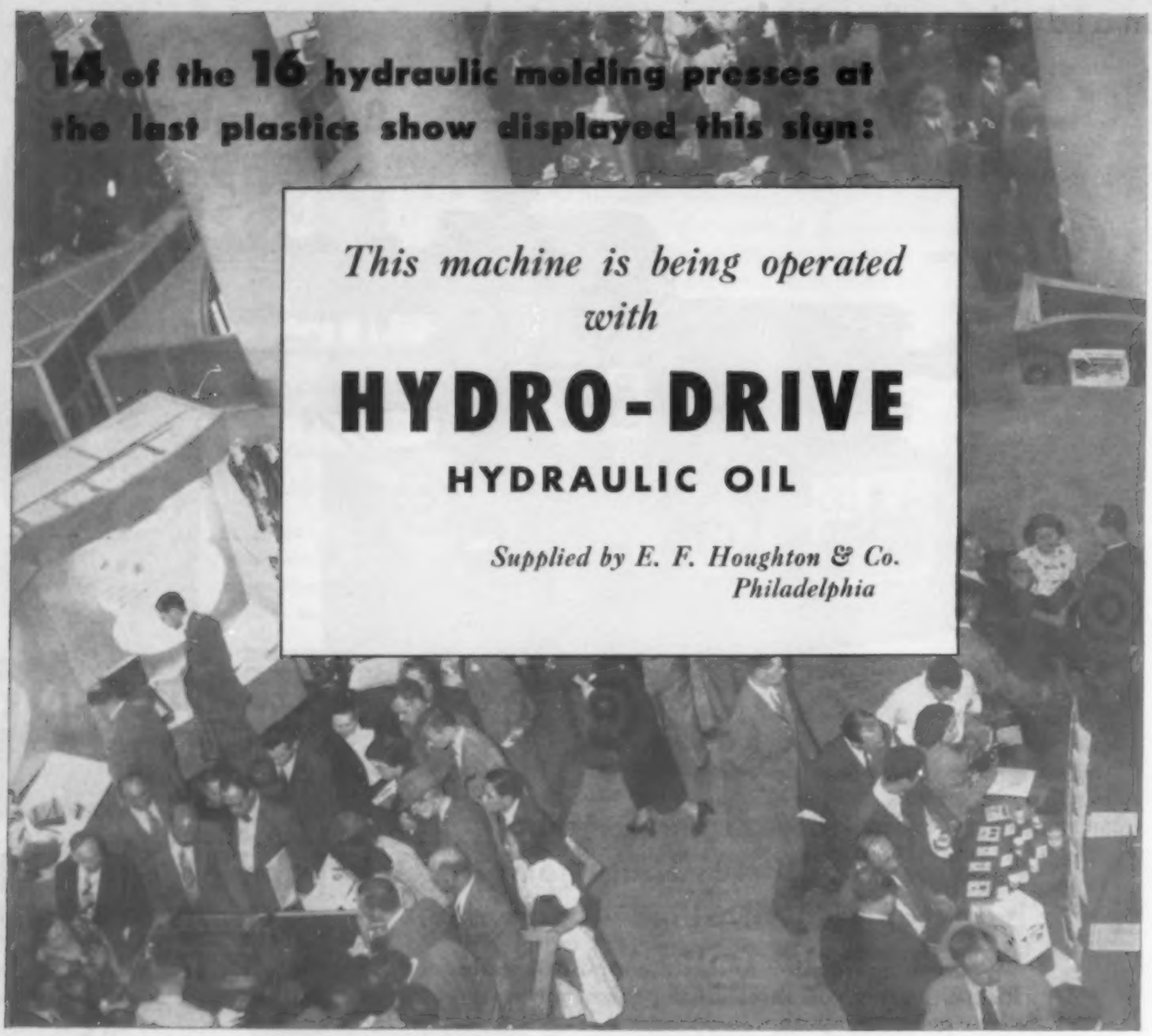
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erties of the cured polyesters. Water absorption and electrical properties may also be influenced to some extent by different peroxide catalysts.

Casting polyesters

Casting polyesters at room or elevated temperatures has received considerable publicity. Referring to Table II, low temperature peroxides are of interest in making room temperature castings in which the use of a promoter compound is optional. Careful selection of the catalyst system is important in this application, especially if flexible molds are employed, in order to distribute exothermic heat of polymerization, thus obtaining maximum mold life. A relatively high catalyst concentration is often employed in room temperature casting to compensate for the absence of externally applied heat. Feuer[3] has published some interesting observations on the crazing often observed when casting large pieces from polyester resins; additional information on the mechanism of resin-catalyst systems also appears in Feuer's paper. A mixture of peroxide catalysts may be useful in room or elevated temperature casting to develop special curing rates.

Handling peroxide catalysts

Although some peroxide catalysts mentioned herein have been described as having high rates of decomposition, it should be emphasized that this refers to reaction kinetics only and that this statement does not refer to properties of the peroxides as shipped, stored, and handled in manufacturing operations. Commercially available organic peroxides can be safely handled and stored for considerable periods if the simple recommendations furnished by the manufacturer are followed.

Conclusion

Processing difficulties can not be solved solely by proper selection of a catalyst system. Greater efficiency and a reduction in production costs can be achieved, however, by employing catalysts fully adapted to current development and production schedules. Organic peroxides are now available to satisfy requirements in the majority of polyester applications and their versatility can be further increased by the use of catalyst-promoter systems or mixtures of organic peroxides. The tables presented here will serve to acquaint investigators with many individual peroxide catalysts which are currently available.

Acknowledgment

The authors express their appreciation to Dr. F. Visser 't Hooft, managing director, and Dr. C. E. Entemann, chief chemist, of Lucidol Div., Novadel-Agene Corp., for helpful suggestions in preparing the manuscript.

[3] S. S. Feuer, The Resinous Reporter 9, 3, (1948).



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Coalescence Behavior

(*Continued from page* 108)

strong evidence of coalescence. On the other hand, at 10 degrees Centigrade below this transition temperature, some slight evidence of coalescence developed only after compression for about 50 hours. This slow development of coalescence below the second-order temperature appears consistent with the finding of Boyer and Spencer[5] that the discontinuity of slope in the volume-temperature curve which characterizes the second-order transition temperature is obtained only with short-time observations. That is, when individual points on these curves are determined after equilibrium is obtained, which requires 20 to 60 hr. observation instead of the customary 20 to 30 min., then no discontinuity develops. This presumably indicates that molecular mobility, while greatly diminished, still exists in this region.

As the temperature at which the surfaces were pressed together increased above the transition temperature, the bond strength measured at room temperature likewise increased. These tensile tests continued to show breaks at the original interface, however, until a limiting temperature and strength were reached. In the typical case of polystyrene this limiting temperature lay 35 to 55 degrees Centigrade above the transition temperature. Coalescence at and above this temperature was complete since the surface of rupture now bore no relation to the original interface, and the tensile strength was equal to that of bulk material. Quantitative data for this region of incomplete coalescence are presented below for the case of granular resins.

Coalescence behavior under low pressure

Powdered or granulated resins were compressed at the relatively low pressure of 140 p.s.i. to form a disk. At as little as 5 degrees Centigrade below the transition temperatures, evidence of sticking between granules developed only very faintly after several days' duration, and disks so formed could not be successfully withdrawn from the mold without crumbling to pieces. At 5 degrees Centigrade above the transition temperature, evidence of coalescence developed almost immediately, in that disks of some strength could now be formed. As in the case of flat surfaces, therefore, the critical coalescence temperature coincided with the transition temperature of the material tested.

These findings are illustrated graphically in Fig. 1, where the modulus of rupture of these disks measured at room temperature is plotted against molding temperature. There are certain similarities to be noted in these curves, in that they always start from zero strength at the transition temperature of each

[5] "Thermal expansion and second-order transition effects in high polymers. III. Time effects," by R. S. Spencer and R. F. Boyer, J. Appl. Physics *17*, 398-404 (1946).

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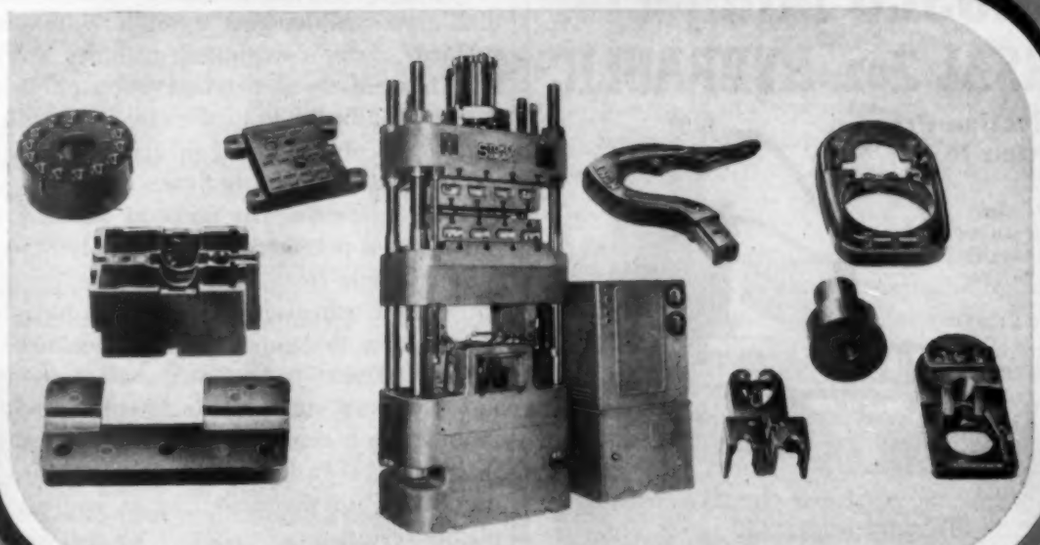
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of the materials tested, showing this to be the critical coalescence temperature. From here, the disks show a rapid improvement in strength with temperature, presumably because coalescence, while incomplete, is increasing, since disk translucency improves and microscopic examination shows an increasing disappearance of grain boundaries. The curves finally level off, reaching a constant strength independent of molding temperature (see for example the right-hand ends of curve I in Figs. 1a and 1d.) In this region, the disk becomes transparent, grain boundaries disappear, and upon breaking the disk, the plane of cleavage is found not to follow the original grain boundaries. This region of constant strength is therefore one in which coalescence is complete, since the disks are now a uniform coherent mass, and disk strength equals that of one made by conventional injection molding procedures.

While the curves of Fig. 1 are qualitatively similar, there is evident a considerable difference in detail in the regions of incomplete coalescence. With some materials, like polyvinyl butyral (Fig. 1b), the modulus of rupture rises steeply with increasing temperature, while with others the increase in strength is much more gradual. Cellulose acetate (Fig. 1d), for example, shows very little improvement in disk strength for about 80 degrees above its transition temperature, and exhibits a notable increase in its modulus of rupture only above 150° C. It was found that the shape of these curves depended upon molding time, particle shape, and particle size and size distribution. This is not surprising, since disk strength depends upon how extensively the surfaces of the component granules are in contact, which is clearly dependent upon particle size and shape. Molding time is likewise a variable, since the extent of contact between granule surfaces slowly increases due to plastic flow.

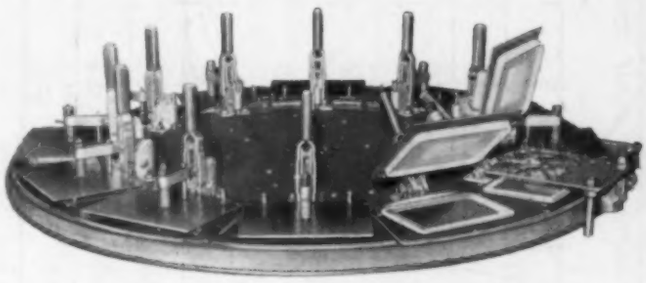
It is interesting to note in passing that three dimensional polymers like fully polymerized phenol-formaldehyde resin do not coalesce, presumably because their transition temperatures have been raised above their decomposition temperatures by cross-linkage. These resins can coalesce only in their thermoplastic stage, through which they pass preliminary to complete cross-linkage upon heating. In this sense, therefore, the considerations presented here apply to thermosetting as well as to thermoplastic resins.

Coalescence of granulated resin at high pressure

It was found that resin granules (but not flat smooth sheets) could often be made to cling together by compressing in a mold at bulk temperatures far below their transition temperatures, if high pressures of the order of 10,000 to 50,000 p.s.i. were used. This is illustrated by the curves of Fig. 2 for ethyl cellulose, which qualitatively resemble those for the other plastics tested at these high pressures, and



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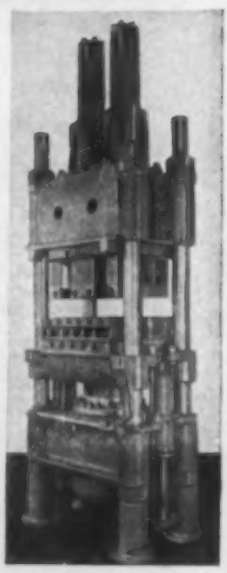
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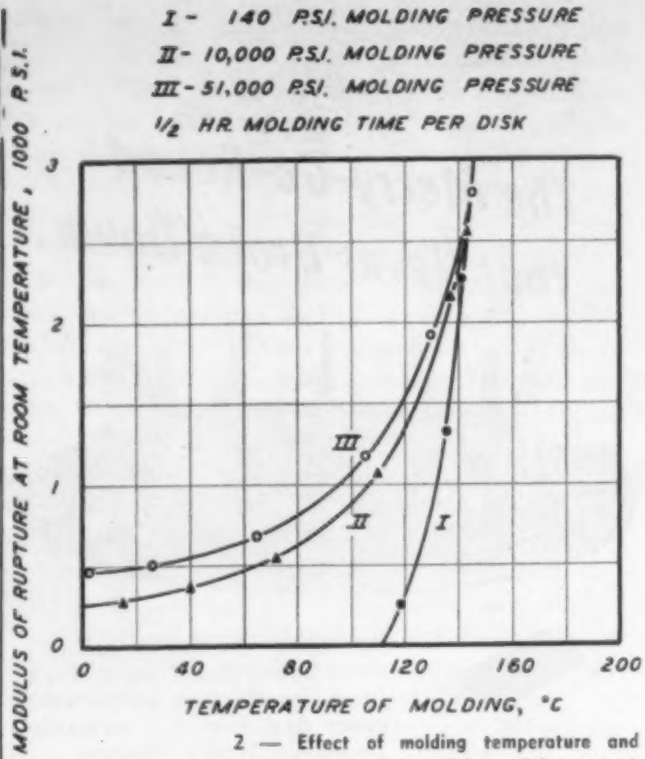
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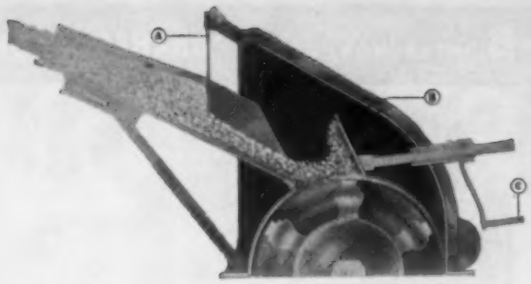
2 — Effect of molding temperature and pressure on ethyl cellulose disk strength

which show how disk strengths are affected by molding temperature.

The mechanism of this disk formation at high pressure is probably similar to the formation of pellets from aspirin, common table salt, iron oxide, metal powders, etc. It was found that such disks could be formed only when the resin granules were of a broken irregular shape, and not when they were spherical. These jagged granules appeared to penetrate into their neighbors to form interlocking mechanical joints, while the spherical shaped particles could not behave in this fashion. Microscopic examination of disks formed from granular powder always revealed some interlocking, without however showing evidence of any disappearance of grain boundaries. No disks formed below the transition temperature when low molding pressures were used, since the pressures were not great enough to generate the necessary mechanical joints.

In order to minimize the possibility of frictional heat creating hot spots within the mass of resin granules during compression, disks were formed below the critical coalescence temperature by applying the pressure so slowly that the final value of 51,000 p.s.i. was reached only after one hour. Such a procedure should minimize hot spot development, since heat would tend to develop slowly and so could be conducted away before excessive local temperatures resulted. It was found that these disks were perhaps 10% weaker than when made in the usual rapid fashion. While this suggests that coalescence due to frictional hot spots is not an important element in

(*Turn to page* 166)



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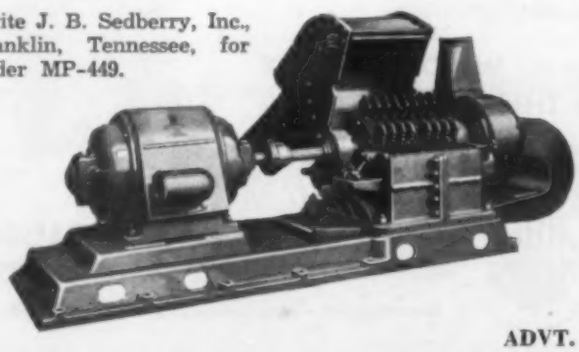
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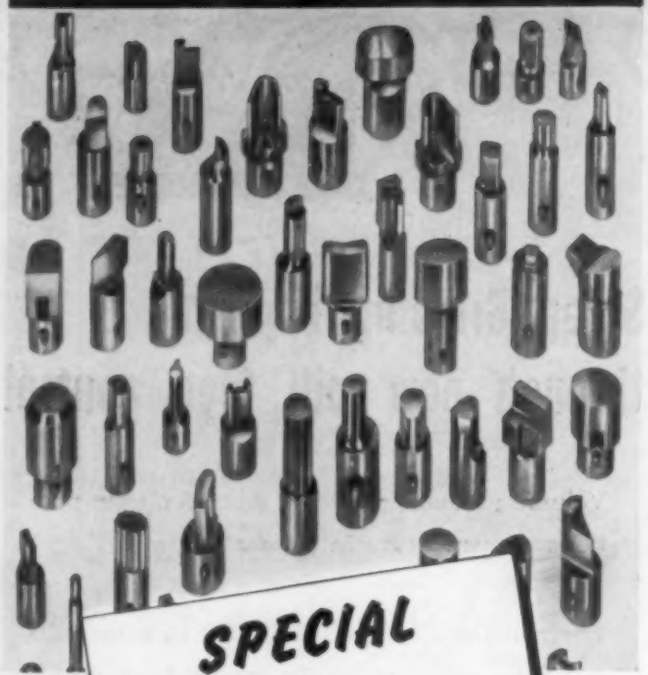
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Efficient CHROMALOX *Electric* Heaters eliminate expensive coal or oil fired steam-boiler operation during the months boilers are not used for plant heating.

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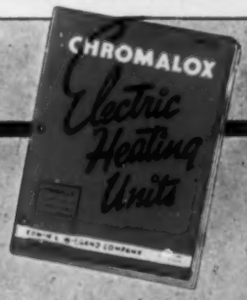
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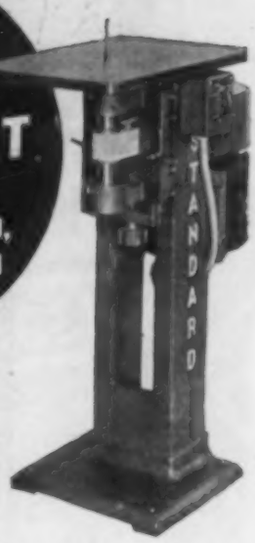
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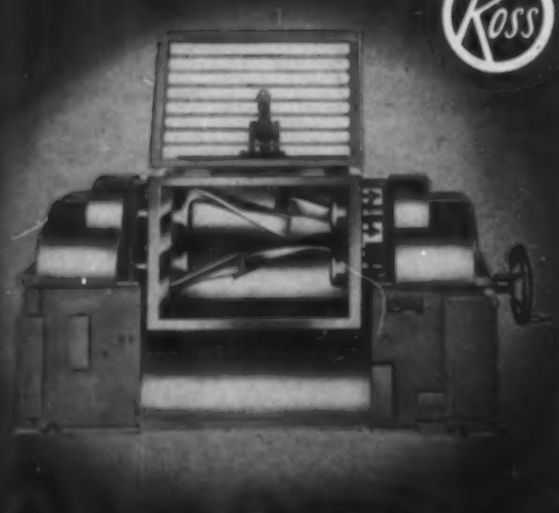
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disk strength here, this possibility cannot be dismissed. Bowden and Ridler[6], for example, showed that remarkably high surface temperatures develop when metal surfaces slide past each other. These authors investigated much higher sliding speeds and lower pressures than are involved here, but their results suggest that "hot spots" could develop when compression of a resin mass causes the granules to slide past each other. Local temperatures well above the bulk temperature, and possibly above the critical coalescence temperature in each case, may develop even when compressing slowly.

Polyethylene (Fig. 1c) showed unusual behavior in that its disk strength above 80° C. was independent of molding pressure between 140 and 10,000 p.s.i. No disks could be formed regardless of pressure in the interval from —68° C. to 80° C., evidently due to the material's softness. Below —68° C., at which temperature polyethylene undergoes another second-order transition, disks could be made (under high molding pressures only) as readily as from other thermoplastics, presumably due to the hardness of the granules in this temperature region. These disks, however, exfoliated into powder when allowed to warm up to room temperature, due probably to the internal stresses developed.

Summary and conclusions

Each of the thermoplastic high polymers tested exhibited a critical temperature below which coalescence rates between flat smooth surfaces of this polymer became vanishingly small, even under high pressures. In each case, this critical coalescence temperature, which corresponded to the transition temperature of the material under test, could be lowered by addition of solvents and plasticizers, or by a reduction in the plastic's molecular weight. The development of increasingly effective coalescence above the transition temperature is presumably attributable to the enhanced mobility of the molecular segments. This mobility is sufficient in the neighborhood of the transition temperature to make possible that minimum orientation of the segments in the two surfaces relative to each other, needed for bond formation. As the temperature rises further, bond strength improves due to increased freedom of the chain segments to orient and flow. For complete coalescence, however, where bond strength equals the cohesive strength of the original material, some inter-penetration of the chains in the two surfaces is presumably necessary in addition to orientation. Such a freedom of molecular motion is attained only at temperatures considerably above the transition point, even when applying high pressure.

The applicability of the concept of critical coalescence temperature to a system of large surface area, such as an emulsion of the polymer in question, has not yet been tested.

[6] "Physical properties of surfaces," by F. P. Bowden and K. E. W. Ridler, Proc. Roy. Soc. London *A154*, 640-656 (1936).

FROM ALL OVER THE WORLD TO LEARN PLASTICS





A miniature United Nations is represented by this group of Plastics Institute Students. They come from seven foreign lands and have journeyed thousands of miles to study Plastics.

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Plastics Institute training is offered on the following three levels:

1. The West Coast University nine-semester course in Mechanical Engineering with specialization in Plastic Processing, leading to the Degree of Bachelor of Science. This course may be completed in three calendar years.
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Plastics Institute is proud of its many successful graduates now profitably engaged in the Plastics industry in all parts of the world. Complete information on courses and class openings upon request.

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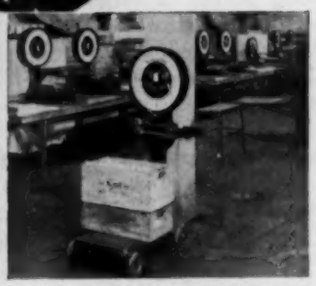
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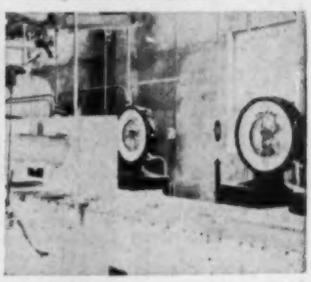
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THE PLASTISCOPE*

INTERPRETATIONS OF THE CURRENT NEWS

By R. L. VAN BOSKIRK

Prices

THE price structure for plastics has undergone considerable juggling in the last month, but the head men in the industry insist that there is still no sign of a serious break. At least, that's the word as we go to press in March.

Vinyl prices—Prices set for 4-mil vinyl film by various producers have fluctuated from 60 to 68¢ over a long period of time, with a variety of pricing arrangements. For example, one producer has been offering 10,000-lb. lots at 64 or 65¢ in more than one width or color combination. Another producer quotes a 30,000-lb. quantity price but will authorize delivery in several shipments over a 3-month period.

*Reg. U. S. Patent Office.

The Bakelite Corp., thus far the largest producer of thin vinyl films and a bellwether in the pricing structure, has announced a reduction in the price of its 4-mil film from 68 to 64¢ per lb. in 30,000-lb. lots, effective February 16. Bakelite officials won't comment further on this situation, but our opinion is offered that perhaps this price revision is its answer to the price juggling that has been going on.

The free availability of dioctyl phthalate, principle plasticizer used in vinyls (see page 81, this issue) is probably another important factor in the vinyl film price situation. Up until last Fall, only small quantities of DOP were available to most processors, and some of the plasticizers used as substitutes didn't always produce high quality film. Since the processors can now obtain all the DOP they need, the quality of all film has improved, and there is less difference in the varieties of film offered to buyers. Hence, premium prices for superior quality are more difficult to collect from the shower curtain, drapery, raincoat, or other vinyl film fabricators.

The chances for further major price reductions in this line in the immediate future are not too promising although it is in the cards for both vinyl resin and plasticizers eventually to come down in price. However, a substantial break in either is not anticipated until there is a more serious decline in the general industrial price structure. A pound of compound today costs at least 39¢, processing would add approximately 15¢, and to this must be added distribution and selling costs.

(*Please turn to page* 170)

Welcome to Our French Contemporary

BORN of the need for an industrial magazine to serve the plastics industry and users of plastics in France and Western Europe is "Industrie Des Plastiques Modernes," a new publication produced by Les Publications Techniques Associees, 40 Rue de Colisee, Paris (8e) France.

MODERN PLASTICS congratulates the editors and publishers on the first issue printed and welcomes the new magazine as an important element in international dissemination of information concerning plastics materials, processes, and applications. MODERN PLASTICS magazine and "Modern Plastics Encyclopedia" are honored to be directly associated with this publishing enterprise.

The firm intention of the publishers of "Industrie Des Plastiques Modernes" to foster new and improved applications of plastics on an ever-increasing scale is shown by their sponsorship of a display of the award winners in the Seventh MODERN PLASTICS Competition, staged from January 15 to February 28, 1949 at the Pavillon de Marson. The many thousands of visitors to the exhibit were also shown the following motion pictures concerning plastics, made available through the cooperation of the American firms listed: from Celanese Corp. of America, "Proving Ground"; from The Society of the Plastics Industry, Inc., "Scientific Approach to Better Plastics"; from Hercules Powder Co., "Careers for Cellulose"; from Rohm & Haas Co., "Looking Ahead Through Plexiglas"; from Bakelite Corp., "Selecting the Right Thermosetting Molding Material" and "Product Design and Molding Technique for Thermosetting Plastics".

In the introduction of this new publication at the convention of members and customers of the French plastics industry on January 15th, MODERN PLASTICS is proud to have played a part by preparing three technical papers which were read by the Editor of "Industrie Des Plastiques Modernes."

Indicative, we believe, of the value of the publication to its market is the excellent editorial content of the first issue, covering new product developments, technology, engineering, merchandising, and feature material which included an illustrated section showing the award winners in the Seventh MODERN PLASTICS Competition. The fact that the advertising pages of this publication contain representation from French, British, and American firms, points up the international significance of the project.

On behalf of the plastics industry all over the world, we say, "Vive la Publication"!

FROM WELL HEAD to FINISHED PRODUCTS



Our work for the process industries includes engineering design and construction of a wide range of installations for natural gas, refining and chemical operations from well head to finished products.





STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY OF STONE & WEBSTER, INC.

THE PLASTISCOPE

It is difficult to perceive how film can sell for much less than current prices until the time comes when raw material and operation costs drop considerably below current prices.

One thing seems certain. The demand for film is still strong, and prospects look good for at least moderate demand in the foreseeable future. If anyone is curious about where film is going, he might check advertisements and note particularly the low prices quoted for vinyl products. A ritzy New York department store is quoting hooded raincoats at $3.95; men's raincoats at $4.95; children's raincoats at $2.95. Draperies are on the market at $2.98. A five-piece set of cottage window curtains is offered at $4.98, and a housewife can buy yard goods to make her own curtains for around 50¢ per yard. The vinyl fabrics seem headed for mass markets, and mass production will most certainly affect film prices in the future.

Acetate reduction—Just as the above copy was finished came word of a 7¢ per lb. price drop in cellulose acetate in translucent colors by Tennessee Eastman Corp. and Celanese Plastics Corp. This price, now 35¢, matches the price for which Celanese had been offering its reworked color compounds, and does not include transparent, extrusion, nor sheet compounds. The Celanese reworked compound, which contains an unspecified amount of virgin material, had been on the market for many months with a steadily increasing color range, but the new prices are for 100% virgin material, according to our information.

It seems fair to assume that further price adjustments in plastics will be coming along before the year is over, although producers are careful to warn customers that raw material costs are not the only factors involved in cost reductions. Labor and costs of doing business are still high. But in the acetate field alone, it is notable that cotton linters are now 3¢ a lb., in comparison to 12¢ in 1947; and alcohol, great quantities of which are used in acetate production, has dropped from 70¢ a gal. last November to transactions reported as low as 17¢, which is probably less than the cost of production for either synthetic or fermentation grade. Diethyl phthalate, a plasticizer used in cellulose acetate, has also dropped 6¢ per lb. to as low as 26¢ in tankcar lots. Furthermore, acetate yarn has also been offered at reduced prices, in a parallel move by the same producers who make cellulose acetate for plastics.

Cellulose acetate and cellulose acetate butyrate molding powder production went up to 4,800,000 lb. in October but dropped back to slightly under 4,000,000 lb. in December, with another small decline from that figure reported in January. The biggest month on record was around 8,000,000 lb. in 1946. Polystyrene, the chief volume competitor for thermoplastic molded parts, went to 16,500,000 in October and dropped to 13,200,000 in December. These figures lead to all kinds of speculation as to what may happen pricewise.

Several other chemicals used in plastics are also now comparatively easy to obtain, with supply ahead of demand in some cases. Such things as benzol, naphthalene, cresol, phthalic anhydride, and phenol—all of which were in tight supply less than a year ago—have suddenly become plentiful, despite an almost unanimous previous opinion that they would be scarce for several years. How soon there will be a large enough price break in these chemicals to affect plastics is unpredictable.

A cent or two drop in basic chemicals makes little difference in the cost of a pound of plastic material, and if production of finished plastics products, paints and lacquers, insecticides, detergents, and dyes should zoom upward again soon, demand for chemicals could easily tighten up, with a resultant price firming. Attempting to guess the near future price set-up in chemicals and plastics with any accuracy is as difficult as attempting to dry oneself with a wet towel.

Low-pressure resin

A LOW-PRESSURE resin with a viscosity of 50,000 to 65,000 Cps. has been announced by the Resinous Products Div., Rohm & Haas Co., as available in commercial quantities. It is suggested for use to improve laminating work by providing a thicker surface coating; to decrease the flow of resin prior to gelation in molding; to improve control of pigment and filler suspension in casting operations; or to increase film thickness of dip coatings.

One of the Paraplex "P" series, the new resin has been designated as P-43HV, and is identical to the tough, rigid Paraplex P-43 except that it is supplied at a polyester-styrene ratio of 80:20 instead of 70:30. Its high viscosity compares with that of 2000 to 2400 Cps. for the Paraplex P-43, according to company information. Both grades use the same base polyester, and both are filtered products, supplied as clear, nearly water-white liquids.

Teflon expansion

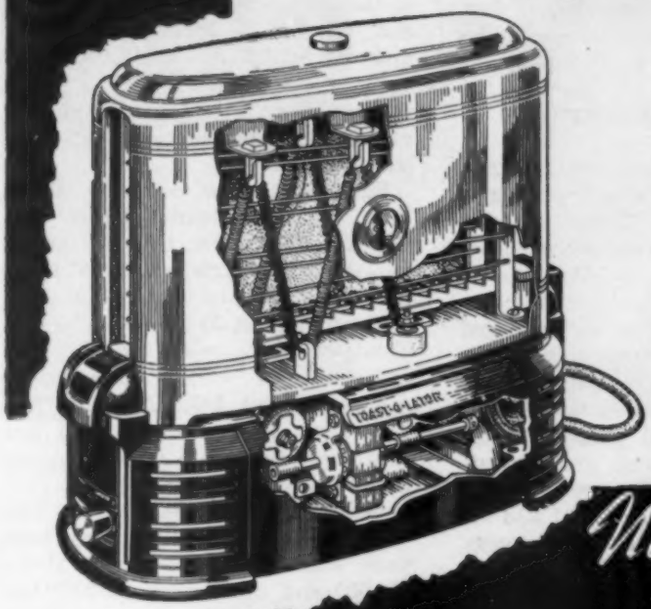
A NEW building unit where it can triple present Teflon production has been announced by E. I. du Pont de Nemours & Co., Inc. The new plant is located near the company's Parkersburg, W. Va., site. Present production is limited to small quantities in a semi-works plant at Arlington, N. J. Chief outlets for this extremely high heat- and chemically-resistant plastic are chemical piping and valve packing, gaskets, and high frequency insulation. High costs and know-how in fabricating are currently holding down more widespread use of this durable plastic, but it is expected that time and experience will modify these factors.

Coordinated advertising

AN advertising campaign by a plastics raw materials producer that has attracted more than the usual attention because it goes deeper than a mere surface scratching is that of Tennessee-Eastman. This campaign has been running twice a month in *The New York Times* for a couple of years and has now been extended to papers in other cities where trade shows or conventions are being held by various industries.

The advertisements are based largely on applications of Tennessee-Eastman products which are generally on display at the trade show concerned. The same ad that appears in the daily newspaper is also used in one of the trade's publications. Thus, at the Housewares Show in Chicago, the Tennessee-Eastman ad also appeared in *Retailing*, with the advertising story addressed to buyers attending the

"PLASTICS are *Right* if they're *Molded* by *Northern*"



Designing, engineering and molding—these *three* skills are all important in custom molding. Northern has all three. And in number of years Northern's experience spans the life and growth of the plastic industry.

It is especially important that the right compound be used in the right place. Northern is familiar with *all* compounds, knows *how* and *when* to use them — and the best way to mold *each* one.

Knowing this, Toast-O-Lator Company, Inc., selected Northern to mold the sturdy, handsome base of this continuous toaster. Phenolic plastic was used. If you have a smart idea, Northern can make it smarter.

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To insure the high quality of your stamping, choose one of the All Purpose foils: *pigment roll leaf, imitation roll leaf, aluminum roll leaf.* These fine foils are flexible and uniform. Designed specifically for hot stamping, they give excellent results in every type of hot stamping press.

Submit sample articles to be hot stamped or write for prices and foil samples.

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ACE *gives you* Ace-High Quality in PLASTIC BALLS



COMPLETELY SEAMLESS
PRECISION FABRICATED

- All sizes (¼" to 1¾")
- All plastic materials
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Write today for Color Bulletins and Samples

Complete facilities for fabricating plastic parts for all industries. Estimates submitted promptly upon receipt of your blueprints or specifications.

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Precision Plastic Fabricators

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show. There were some 500 manufacturers and 7000 buyers at the show, and a copy of the trade paper containing the advertisement was placed in the hands of each visitor.

A similar procedure, slightly modified to meet the occasion, was followed at the Sportsman's Show in New York and will be repeated at other trade shows during the year.

In order to make sure that no one misses the Tennessee-Eastman message, the company also uses direct mail to distribute its advertisements to those who attend each show.

More speed fasteners

OUTPUT of the Tinnerman Speed Nuts, widely used in the plastics industry, averaged more than 100,000,000 units per month in 1948. The billion mark for the year was passed in October. More than 4000 different types of these spring steel fasteners are made for industry today, and demand still outruns supply. Additional production facilities are planned for the near future.

Mold lubricant

A LIQUID mold release material called Logolube has been created by Bee Chemical Co., 13799 South Ave. "O", Chicago 33, Ill. It is said to be easier to apply and control than mold lubricants in dust form and to require less material to do a job in comparison with other liquid lubricants. Logolube may be thinned for spraying on the mold or it may be applied with a brush.

Mold release compound

EFFECTIVE in both compression and injection molding, a new mold release compound called Mold-Eze has been placed on the market by Moldrite Products Co., 145 Garden St., Pawtucket, R. I. It is claimed that this material will improve flow but will not cause flash, will not affect gloss, will not build up deposits on mold surfaces, and will not contaminate the product or break down at molding temperatures.

Mold-Eze is claimed to have long shelf life and to be inxpensive to use. The cost per machine on an 8 oz. shot with 32 small articles is reported as approximately 1¢ per day. Samples of the product will be sent on request to the company.

Low cost urea

THE low-cost black and brown Beetle urea molding compounds which American Cyanamid Co. brought out last summer have been reduced from 16½ to 16¼¢ per lb. in carload lots. According to company spokesmen this lower priced thermosetting molding compound is being used in increasingly larger quantities for closures and wiring parts. Its electrical properties, including arc resistance, are particularly notable. Regular urea molding compound was selling for 31 and 32¢ in standard colors at last reports.

Muzak markets vinyl compounds

A CUSTOM vinyl plastic compounding service has been set up by the Transcription Div. of Muzak Corp., 229 Fourth Ave., New York 3, N. Y. Richard A. Wilson, vice-president of Muzak and general manager of the Transcription Div., says of the new program: "We plan to market Vinylite compounds to molders of plastic products in three forms; namely, sheet, preforms, and in granular plastic. The composition of the Vinylite compound in any of the three forms will be determined by the needs and specifications of the individual manufacturer."

This new phase of Muzak activity will operate from the Elizabethtown Corp., a Muzak subsidiary in Elizabethtown, Ky., which mills the special Vinylite compound used by the Transcription Div. in record pressings. The Banbury operation at the Elizabethtown plant, working at capacity, can mill 25,000 lb. of Vinylite per day.

Plastic plaster

NOW in the pilot plant stage is Scotch Top, a plaster made of latex and powdered resin. It is claimed that two men can cover as much area with Scotch Top in one day as could be covered in five days with conventional plaster.

Announcement of Scotch Top was made by Minnesota Mining & Manufacturing Co. when 8000 shares of that company's stock were added to the portfolio of Chemical Fund, Inc. The announcement also called attention to the firm's development of fluor-carbons, which are expected eventually to find diverse markets in the form of oils, greases, or plastics. While other producers depend upon pure fluorine to make fluor-carbons, Minnesota Mining uses cheaper hydrofluoric acid, which is easier to handle, according to company literature.

Since 1933, the company states that it derived about $30,000,000 in new business for each $11,000,000 it has spent in its laboratories. Currently, the various Scotch tapes account for about 35 to 40% of sales. Total company sales for 1948 are estimated at about $108,000,000, compared with $93,400,000 in 1947. The sales increase has continued into early 1949, with volume in the first 20 days of January about 40% ahead of the like 1948 period. The company believes that sales next year will amount to about $140,000,000 and may reach $162,000,000 by 1954.

Flame-retardant acetate

WIDESPREAD experimentation is now going on with a plasticizer for cellulose acetate which, it is believed, will make the material even more fire-retardant than the various fire-retardant acetates that were announced in 1948. The new plasticizer is reported as tri-chlorethyl phosphate, and experimenters foresee a good possibility that it will succeed triphenyl phosphate and other plasticizers of similar type currently used to help improve flame-resistant properties.

Improved nylon and acrylic

THIRTEEN colors for general purpose type nylon molding powder have been announced by E. I. du Pont de Nemours & Co., Inc. Four more will be on sale in the near future. Up to now, nylon molding powder has been available only in natural color. Prices of the colored molding powder are slightly higher than uncolored.

Du Pont has also announced commercial production of a new heat-resistant acrylic molding powder which can be molded successfully at temperatures about 50° F. higher than were practical with the heat-resistant material it replaces. The new powder is designated as Lucite HM-140 as distinguished from HM-122, its predecessor. It is claimed



Clearsite containers molded of Styron by Celluplastics Corporation, 50 Ave. L., Newark 5, New Jersey



...the plastic with the ~~PLUS~~ value!

specify STYRON

Mass production at low unit cost is the plus value STYRON *offers you.* That is why manufacturers specify STYRON (Dow Polystyrene) for a multitude of industrial and commercial applications. They are fully aware of the high quality of STYRON—its excellent adaptability and, above all, the fact that STYRON offers more pieces per pound.

STYRON proves its unique versatility in the mass production of the above shown containers. The use of STYRON affords these containers such sales advantages as: 75% lighter weight than conventional containers, crystal clear or gem-like colors, no danger of shattering, dimensional stability, uniformity and they are tasteless, odorless, acid and alkaline resistant. These STYRON containers are finding numerous applications in the drug and cosmetic fields.

The low cost and high quality of STYRON permitted its use in mass production. Let STYRON solve your production problem—contact Dow today for a competent molder to handle your specific problem.

DOW plastics

PLASTICS DIVISION, DEPT. T-22

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Cleveland • Detroit • Chicago • St. Louis • Houston • San Francisco • Los Angeles • Seattle • Dow Chemical of Canada, Limited, Toronto, Canada

THE PLASTISCOPE

that the new material is more fluid at a given molding temperature than the older material and that it can be molded into thick sections at lower temperatures, and will therefore cool and harden more rapidly than the older type. This results in a shorter molding cycle with less shrinkage of the molded pieces. The new material is also reported to be more brilliant and lustrous than its predecessor.

Premium resurgence

AN advertising novelty molded and marketed by Waterbury Companies, Inc., Waterbury, Conn., indicates that the market for premiums is again surging. Waterbury's latest is a small combination telephone dialer - magnifier - letter opener made from polystyrene or re-ground acrylic, of which 400,000 units were sold in the latter part of 1948. It is expected that more than 1,000,000 will be distributed in 1949 to banks, insurance companies, real estate firms, publishing houses, etc. The novelty may be obtained either plain or imprinted. It sells at around 4½ cents.

Plastics promotion

PROMOTION of infant's department merchandise made from Monsanto Chemical Co. products was carried on by 329 leading stores in the country during March. Spearheading the program was a full page advertisement in the *Saturday Evening Post*. Blow-ups of the ad and cover of that magazine were supplied to the stores, along with accessories, newspaper mats, photographs, and suggested radio scripts. A special issue of Monsanto's *Plastics Merchandiser*, with buying information on 171 infant's department items, was sent to store buyers as part of the promotion.

Florida weather testing

ARRANGEMENTS have been made by Sam Tour & Co., Inc., 44 Trinity Pl., New York, N. Y., for weather testing of plastics and other materials in an outdoor testing station of Miami, Fla., which provides the maximum of exposure to the sun's rays.

The company has recently reorganized its Mechanical Engineering Dept., under the supervision of John J. Meadows.

Dental plastics

A FELLOWSHIP in the Academy of Denture Prosthesis was recently awarded to Dr. LaMar W. Harris, 25 E. Washington St., Chicago, Ill., for his work on dental plastics, particularly the laminated denture base made of a combination of methyl methacrylate, polystyrene, and glass fiber impregnated with polyvinyl butyral. The laminated base is notable for heat resistance, low water absorption, and freedom from warpage.

Dr. Harris took advantage of directional polymerization to make a strain-free material. In other words, he eliminated strain by curing thin parts of the specimen first, then progressively curing from thin to heavy sections.

Dr. Harris asserts that development of the new plate was a result of his observation of the use of plastics in certain Naval Ordnance applications while he was doing plastics research for the Navy Dept. in the Naval Hospital at Bethesda, Md., during the war. He believes that molders, in turn, might learn something from plastics techniques used by dentists.

Dr. Harris points out that it will probably be several years before there is wide-scale adoption of the new denture. The history of plastics in dentistry is full of forward and backward movement due to overenthusiasm that sometimes developed for materials which did not always prove satisfactory. For example, there was great enthusiasm for a denture of phenolic in 1919, but long-time usage resulted in color fading and brittleness. As a result, dentists who had used them became chary of the word "plastic."

The now conventional acrylic denture was available for at least 5 yr. before it came into widespread general acceptance; many dentists at first feared such things as toxicity, allergies, discoloration, etc.

The development of plastic teeth has followed the same trend. Ten years ago the plastic tooth was called a "glorified putty." Acrylic teeth have been used since then to a considerable extent, but the larger manufacturers were slow in putting them on the market. It was only last year that one of the largest tooth manufacturers added plastic teeth to his line. The plastic tooth has by no means reached the zenith of perfection, according to dentists, who hint that a new one showing vastly improved properties is under development.

"Upside down" copolymer

ISOPOL RESIN, an "upside down" copolymer of styrene and isoprene, is now in pilot plant production by Union Bay State Chemical Co., Cambridge, Mass. It is a hydrocarbon resin with moderately high molecular weight, made up of approximately 75 parts styrene and 25 parts isoprene, which is exactly the opposite proportions to those usually found in synthetic rubber.

It is described as a modified polystyrene in which the isoprene acts as an internal plasticizer. The advantages of polystyrene (inertness, cost, color, etc.), are retained while the disadvantage of brittleness has been partially eliminated. Isopol resin may be used in a solution, in an emulsion, or as a solid although it is available at present only in solid form.

Technical data sheets and samples of the new resin are available upon request to Dept. R-1 of the company.

Styrene-butadiene for molding

FURTHER information concerning the use of high styrene-butadiene copolymers with polystyrene, referred to in these columns several months ago, has been supplied by Dewey and Almy Chemical Co., Cambridge 40, Mass.

The company asserts that its Darex Copolymer X-34 has been blended with polystyrene to give tough, fairly transparent blends. The compounds are best made by mixing resins, X-34, and pigments on a heated mill or internal mixer, although fairly good results have been obtained by simply blending the X-34 powder with colored polystyrene molding pellets in a tumbling drum just prior to injection molding.

The company points out that polystyrene in such a combination contributes low cost, surface hardness, and glossy finish while the X-34 gives higher elongation, impact strength, and good mold flow. They

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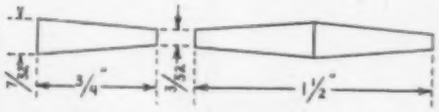
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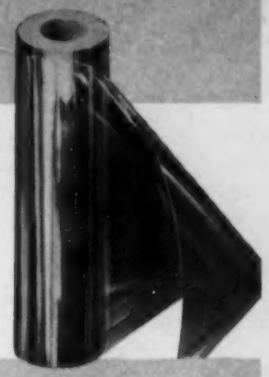
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also recommend that Darex Copolymer X-34 should be considered for plastics products wherever a low density, semi-rigid thermoplastic is needed which has greater toughness and reduced brittleness and where color and finish are less important than improved physical properties.

Up to this time, X-34 alone or blended with polystyrene has been injection or compression molded into battery boxes, pipe stems, tool handles, etc. Most of these have been experimental, but X-34 is now being used commercially in punch press pads and handles for electricians' screw drivers and other tools. Its advantages in these applications include resistance to cutting, excellent insulating qualities, enough stretch to prevent breakage when forced on metal parts, and good adhesion to the metal.

The company is not averse to mentioning the disadvantages of this material which are, of course, well known. Chief among them is color, which sometimes is water-white but which may be amber or darker. Accordingly the material is usually restricted to use in translucents and opaques, in white, colors, and black, and to certain colored transparents such as ruby, amber, and sapphire.

In addition to color disadvantages, the copolymers which show greatest toughness tend to have softer surfaces which are rather easily marred. Shrinkage in molding which dulls the finish of a molded item is also a problem that calls for more investigation. Additional experimental work by custom compounders is required to overcome these problems.

The Organic Chemicals Div. of Dewey and Almy has a bulletin, Plastic Data Sheet P-1, on the subject which it will send to interested parties.

COMPANY NEWS

Panelyte Div., St. Regis Paper Co., 230 Park Ave., New York 17, N. Y., has announced production of a new glass-phenolic laminate which it claims is superior to similar laminates now on the market. Known as Grade 170, the laminate is said to be extremely low in water absorption and power factor, and exceedingly high in flexural and impact strength, as measured by ASTM methods. It is suggested that this laminate may eliminate the necessity of anti-fungus treatments and other special handling now required for equipment destined for use in tropical climates and under high humidity conditions.

Taylor Fibre Co., Norristown, Pa., has announced a new grade of phenol fiber, Taylor Grade XXXP-1, which is said to offer unusually high insulation resistance combined with low power factor and low dielectric constant under extreme climatic conditions. It is recommended for switch stators and rotors, socket bases, condenser stators, insulating washers, and similar applications. The phenol fiber is furnished in semi-gloss or polished sheets, natural tan in color, and in thicknesses from 0.015 to 0.25 inch.

Molded Products Corp., 4533 W. Harrison St., Chicago 24, Ill., has appointed Wm. Fry of W. E. Fry & Co. as its sales representative for compression molded products in the Missouri, Kansas, Iowa, and Nebraska area. Headquarters for this area are at 909 Wyandotte, Kansas City 6, Mo.

Chicopee Manufacturing Corp., 47 Worth St., New York, N. Y., has announced the appointments of J. F. Nicholl as vice-president and a member of the board of directors, and G. H. Day as vice-president of the firm. Mr. Nicholl is general manager of the Lumite Div., while Mr. Day is general sales manager of that division.

Also announced by the company was the appointment of George V. Atkison, formerly with Du Pont in Arlington, N. J., as manager of the Decorative Fabrics Section, Lumite Div. Jack E. Robertson was named Lumite woven plastic fabric representative in St. Louis, Mo., and William W. Crumpton in the Georgia, east Tennessee, North and South Carolina, Alabama, and Florida territory. Douglas Duncan McCord has been appointed assistant designer in the Lumite fabrics department.

General Electric Co., Chemical Dept., has announced the appointment of James W. Raynolds, former vice-president and director of Sun Chemical Company of New York, as sales manager of silicone products, with headquarters at Waterford, N. Y.

P. F. Preston has been appointed Chemicals Div. manufacturing manager for the Chemical Dept., with headquarters in Pittsfield. He will supervise production processes at G-E silicone, alkyd resin, and plastics materials plants at Waterford, N. Y., Schenectady, N. Y., Anaheim, Calif., and Pittsfield, Mass. Mr. Preston was formerly with the Allied Chemical and Dye Corp., Barrett Div., and with the Plastics Div., E. I. du Pont de Nemours & Co., Inc.

Manco Products Co., 2401-2409 Schaefer Rd., Melvindale, Mich., producers of Tru Cast Beryllium copper cavities, has appointed G. Palmer Humphrey, 366 Madison Ave., New York 17, N. Y., as district manager. L. M. Loveless has been named to a corresponding post for the northwestern New York state and Pennsylvania area, with headquarters at 544 Sibley Tower Bldg., Rochester, N. Y.

Bakelite Corp. has consolidated the Laminating and Adhesives divisions of its Thermosetting Dept., into the Laminating and Adhesives Div. Harry Carlson has been appointed manager and J. L. Rodgers assistant manager.

C. E. Gobeil Co., 2635 University Ave., St. Paul, Minn., has been appointed exclusive representative for Hydro-Line Manufacturing Co. equipment in Minnesota, North Dakota, South Dakota, and part of Wisconsin.

Monsanto Chemical Co. has consolidated its two sales offices in Los Angeles, Cal., at 859 E. 60th St., and 605 W. Olympic Blvd., into one location at 714 W. Olympic Blvd. Also announced was the appointment of Kenneth W. Short as purchasing agent for the Plastics Div. at Springfield, Mass.

Celanese Corp. of America 180 Madison Ave., New York 16, N. Y., has announced the following personnel changes: William M. Porter, former director of sales, Sheet Dept., has been appointed to the newly created post of assistant general sales manager. John J. Keville has assumed new duties as director of sales, Sheet Dept. He was formerly

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assistant director of sales, Molding Materials Dept., and director of the Product Application Dept. Edward H. Miller, formerly New York district sales manager, has been named director of sales, Molding Materials Dept. He is succeeded by James T. Growley, former New Jersey sales representative.

William R. Porter, former director of sales, Molding Materials Dept., has resigned. Robert C. Cory has retired, after 27 years in the Plastics Div., and is succeeded by Charles H. Edgar.

The Hydraulic Press Manufacturing Co., has moved its Central District Sales office from Cleveland to Mount Gilead, Ohio, where it is located next door to the firm's engineering, manufacturing, and service departments.

Taylor Manufacturing Co., 3056 W. Meinecke Ave., Milwaukee 10, Wis., has changed its company name to Wright Manufacturing Co., in recognition of one of its major products, Wright Rubber Tile. Announced at the same time was the appointment of Bertram R. Scheff as general sales manager. General sales headquarters will remain in Milwaukee. Administrative offices will be located at the new $2,000,000 plastics molding plant in Houston, Texas, which is scheduled to be completed sometime during the month of April.

This new plant will produce custom molded plastics for industrial and consumer markets, as well as football cleats, rubber tile flooring, and other items in molded rubber, according to Carl Eckenrool, superintendent of the Plastics Div. It will have some 18 presses of from 50 to 300 ton capacity.

Extruders, Inc., 8599 Higuera St., Culver City, Calif., has announced what it claims is the first commercial extrusion of polyethylene film west of Chicago. The material is said to be available in lay-flat tubes 2 to 54 in. wide, in gages of 0.0015 to 0.004 inch. Gusseted tubes will also be available.

Gotham Plastics Corp., 110 Sherman Ave., New York 34, N. Y., has added a new and complete service to its standard fabricating operations. Gotham will assume all the details of the manufacturing of plastic or metal parts, including tooling and the procurement of materials needed in the assembly. The company will then assemble the finished piece into a thoroughly inspected product, and pack and ship it. If the distributor or manufacturer prefers to do his own procurement and molding, Gotham will assemble all the parts shipped to them and perform any other service that may be required.

Bloomfield Molding Co., Bloomfield, N. J., has purchased I. Schwartzman & Son and Anaconda Plastics Mfg. Co. The Bloomfield Molding Co. operates its own plant, with over 37,000 ft. of manufacturing space complete with modern compression and injection molding equipment and a tool room where all its molds are made and designed.

Arvin Plastics Corp. has opened permanent offices and showrooms at 1186 Broadway, New York 1, N. Y.

Art deAngelis, plastic consultant, has moved to new offices in the Packard Bldg., 15th and Chestnut Sts., Philadelphia 3, Pa.

Synthane Corp., Oaks, Pa., has appointed Herbert W. Widdop, formerly assistant sales manager, as sales manager to succeed the late J. B. Rittenhouse. Eldridge E. Smith, formerly in charge of the company's Philadelphia sales territory, was named assistant sales manager.

Tech-Art Plastics Co., Long Island City, N. Y., has announced the appointment of Robert E. Crotty, manager of the New York City office of the Heminway Corp., manufacturers of fancy set-up paper boxes, as its sales representative.

Snyder Tool & Engineering Co. has purchased Arthur Colton Co., builder of production machines for the drug, plastics, and packaging industries. The former organization, which was founded 24 years ago, specializes largely in machines for producing high precision automobile parts. The Colton Co. was established in Detroit in 1884 and was also dedicated to special purpose machines, largely for automatic packaging. Operations will be transferred to the modern Snyder plant, but the new subsidiary will continue to operate under the name of Arthur Colton Co.

Plastic Molded Products Co. has moved to a new and modern plastic molding plant at 6044 N. Pulaski Rd., Chicago 30, Ill. The firm has also added three new High Speed injection molding machines up to 32 oz. capacity.

Dow Chemical of Canada, Ltd., has announced plans for a $5,000,000 plant expansion program in Sarnia, Ont., during 1949. The project will boost the value of Dow Chemical units in the Sarnia area to more than $17,000,000. Present Dow units there include an ethylene glycol plant and a Styron plastic molding powder plant which went into production the first of the year.

National Plastic Co. has moved its Los Angeles, Calif., headquarters plant and warehouse from its former location at 6819 S. Avalon Blvd., to new and larger quarters at 2591 E. Foothill Blvd., Pasadena 8, Calif.

B. F. Goodrich Chemical Co. has moved its New York sales office to Suite 1600, 475 Fifth Ave., New York 17, N. Y.

PERSONAL NEWS

Farnsworth Chapin has been appointed manager of New Product Sales for Lippincott & Margulies, Inc., industrial designers. He was formerly associated with Plastics Manufacturers, Inc., Stamford, Conn. In his new capacity, Mr. Chapin will place, as proprietary items, new products, designed, engineered, and market tested for consumer sales by the firm's design engineers and market research staff. The New Products Dept., an adjunct of the Product Design Dept., was recently set up by the firm to study new applications of plastics and other materials.

Sherman R. Thayer has been elected treasurer and director of Parkwood Corp., Wakefield, Mass.

J. W. Richardson, sales representative for the Plastics Dept., Rohm and Haas Co., Kansas City, Mo., has transferred his headquar-

take a **CLEAR VIEW** of the Future

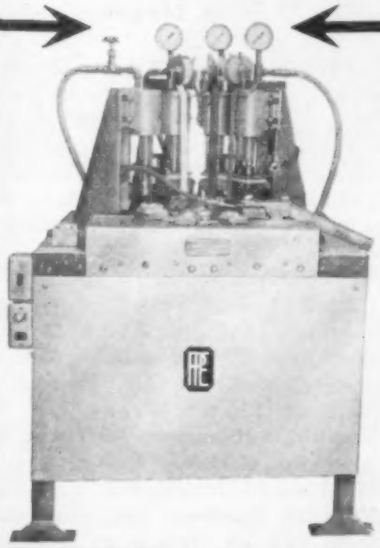


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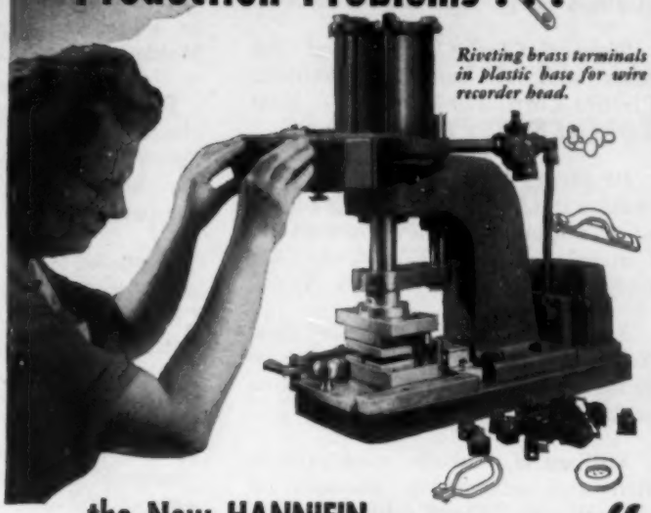
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Richard Clarke has joined the sales staff of Lancaster Moulded Plastics Corp., 110 W. 40th St., New York 18, N. Y.

Dr. Henry B. Hass of Purdue University has been appointed manager of research and development of General Aniline & Film Corp., 230 Park Ave., New York 17, N. Y.

J. A. Lacey has been named New York representative for Cincinnati Industries, Inc., Cincinnati 15, Ohio, with offices at 130 W. 42nd St.

William H. McHale, sales promotion and advertising manager of the Plastics Dept., Plastics and and Resin Div., American Cyanamid Co., has been appointed chairman of the Public Relations Committee of The Society of The Plastics Industry, Inc.

Dr. Edward L. Kropa has joined the Borden Co.'s Chemical Div., as chemical director, succeeding Dr. John F. Corwin who resigned January 31 after five years' service. Dr. Kropa was formerly with the American Cyanamid Co., where he headed up research on resins and plastics.

Sam L. Brous, formerly manager of the Chemical Sales Dept. of B. F. Goodrich Chemical Co., with whom he was associated for 20 years, has joined the General Electric Co., Pittsfield, Mass., as marketing manager of the Chemical Dept. He will have direct charge of advertising and market research activities and will formulate price, sales, and distribution policies.

Dr. William C. Dearing has been appointed director of research and development in the Electro-Textile Div., Behr-Manning Corp., Troy, N. Y. Dr. Dearing was formerly research director with Plaskon Div., Libbey-Owens-Ford Glass Co.

Anthony A. Williams has been named assistant director of the Product Development Dept., Chemical Div., Celanese Corp. of America. He has directed Market Research in the Chemical Div. since Sept., 1946, and will continue as head of market research and analysis as well.

Harold J. Melloy has joined the Patent Button Co., Knoxville, Tenn., as sales engineer for the Custom Molded Plastics Div.

Lincoln A. Steinhardt has been elected assistant treasurer of Joseph Davis Plastics Co., Arlington, N. J. He became associated with the company in 1946.

Herbert Hopkins has been appointed sales representative in the Chicago, Ill., area for Gering Products, Inc., Kenilworth, N. J.

Henry A. Garfield has joined William Whitman Co., Inc., 261 Fifth Ave., New York 16, N. Y., as sales representative for plastic film and extruded products in the New England area, with headquarters at the firm's Boston, Mass., office located at 78 Chauncy St.

William B. Hoey, formerly with Plastic Processes, Inc., Birmingham, Mich., is now Detroit representative of Perry Plastics, Inc., Erie, Pa.

John R. Sargent, well-known in the plastics industry through his work as a market analyst, has been made a partner in the firm of Cresap, McCormick and Paget, New York and Chicago management engineers.

John K. Boosahda, engineer, Plastics Div., Omni Products Corp., is now on an extensive tour of India and Pakistan, where he will service his company's customers and will also be available for technical consultation to other members of the industry in those countries.

F. R. Esterbrook and **G. V. Sammet, Jr.,** have been appointed vice-presidents of Northern Industrial Chemical Co., South Boston, Mass. Both will continue in their present capacities, the former as sales manager, and the latter in charge of production.

Deceased

Mrs. Nathan Lester, wife of Nate Lester, president of Lester Engineering Co., Cleveland, Ohio, died Feb. 8. She was well known in the industry because of her regular attendance at conventions and meetings, where she won the affectionate title of "Mama" Lester.

Kirk Brown, 88, founder of the Dunlop Tire Company of America, and one of the organizers of Bakelite Corp., died Feb. 13 in Florida.

MEETINGS

April 11-14—1949 Conference National Association of Corrosion Engineers, Cincinnati, Ohio.

May 2-4—Third Annual National Meeting, Forest Products Research Society, Civic Auditorium, Grand Rapids, Mich. Open to non-members as well as members.

May 8-12—Regional meeting, American Institution of Chemical Engineers, Mayo Hotel, Tulsa, Okla.

May 10-13—18th Annual National Packaging Exposition, Public Auditorium, Atlantic City, N. J. Annual four-day American Management Association Conference on Packaging, Packing and Shipping will be held in the Auditorium May 10-13, concurrent with the Exposition.

May 19-21—Spring meeting, Society for Experimental Stress Analysis, Hotel Statler, Detroit, Mich.

May 26-27—Annual meeting, Society of The Plastics Industry, Edgewater Beach Hotel, Chicago, Ill.

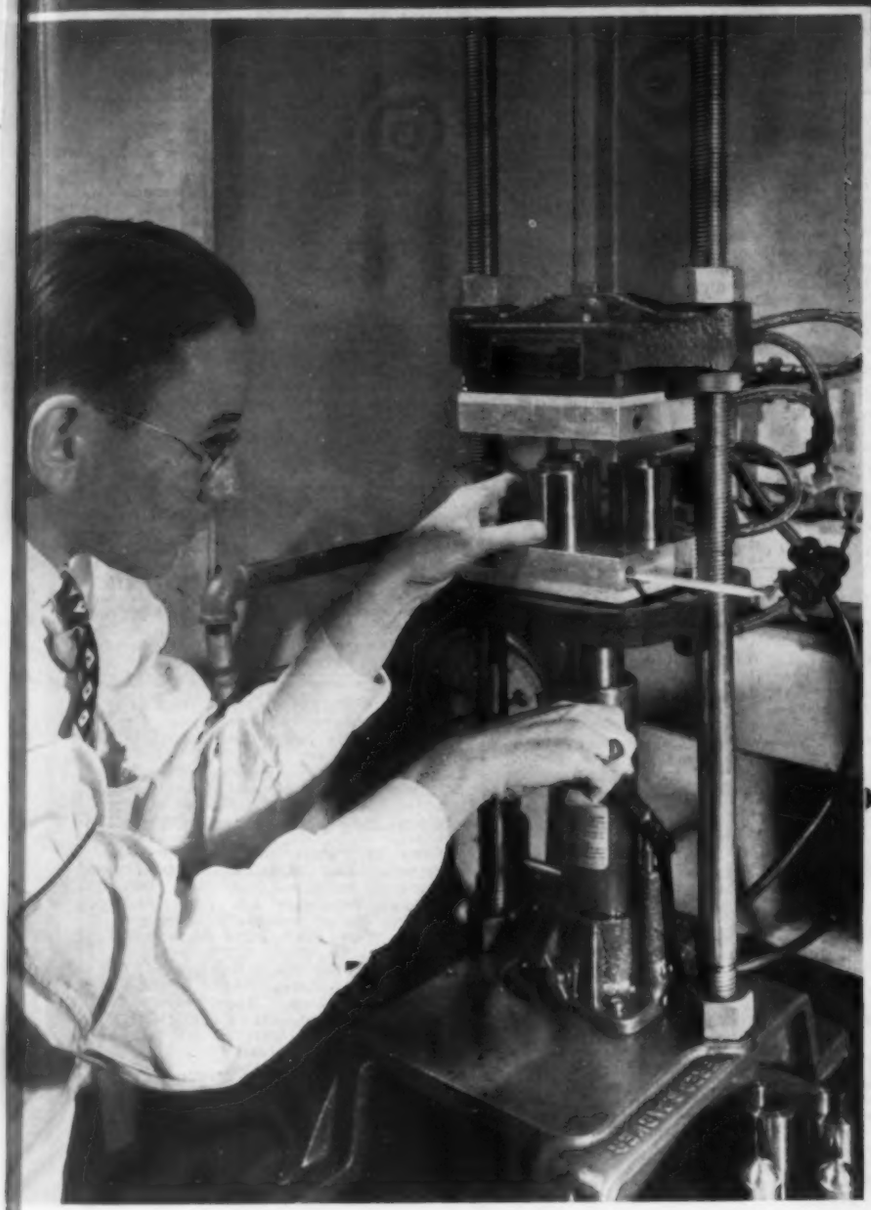
S. P. E. Meetings

April 11—Upper Midwest Section, Rooms 307-8-9, Coffman Memorial Union, University of Minnesota. Dinner meeting 6:30 p. m. Speaker will be R. W. Van Sickle of Dow Chemical Co., Midland, Mich. His subject will be "New Thermoplastics at Dow."

April 12—New York Section, Hotel Sheraton, Lexington Ave. at 37th St., New York. Dinner meeting 7 p. m. Speakers will be Dr. Russell B. Akin of Plastics Dept., E. I. du Pont de Nemours & Co., Inc., Arlington, N. J., and Herbert Proske of Wheelco Instrument Co., New York, N. Y. Their respective subjects will be "Nylon as a Plastic Molding Material," and "Personal Impressions of European Conditions —From a Trip Through France, Belgium, Germany, Holland, England, Switzerland, and Portugal."

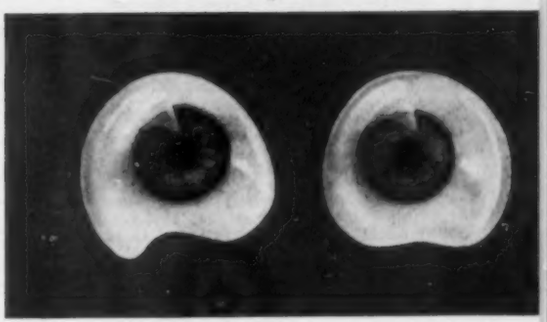
May 9—Upper Midwest Section. Plant visit to Minneapolis-Honeywell Regulator Co.

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WANTED: PLASTIC Scrap or Rejects in any form. Cellulose Acetate, Butyrate, Polystyrene, Acrylic, Vinyl Resin, etc. Also wanted surplus lots of phenolic and urea molding materials. Custom grinding and magnetizing. Reply Box 318, Modern Plastics.

FOR SALE: Farrell 15" x 36", 2 Roll Rubber Mill, other size 30" to 84"; Royle #2 Perfected Extruder; 500 ton Hydr. Molding Press 42" x 48"; Field 500 ton 25" x 30"; Francis 200 tons; 24" x 18". Albert 100 Ton, 2 opening, 24" x 24". Also presses 20 to 250 tons from 12" x 12" to 36" x 36" & 40 ton Broaching Press. Watson-Stillman Hor. 4 plgr. 1" x 2" x 4" H. & L. Pressure Pumps; HPM 1⅜" x 6"; vertical triplex 10 GPM 2700 lbs.; 7 Hydr. Oil Pumps, Vickers, Oilgear, Northern, etc., Elmes 1" x 4" & 1¼" x 4" hor. 4 plgr. 5 to 8 GPM 4500 lbs. & 5500 lbs., Elmes 2" x 6" hor. 30 GPM, 2500 PSI.; Rumsey 4½" x 8" vert. Triplex 65 GPM 900 lbs.; Elmes 2½" x 4" hor. 17 GPM 850 lbs.; Hydr. Steam Pumps; Low Pressure Pumps 150 to 600 lbs. Hydr. Accum.; Stokes type 200 Automatic Molding Press, Stokes Rotary Preform Tablet Machines 1-3/16", 1¼" and ⅝", also single punch; Injection Molding Machines 2 oz. to 12 oz.; Baker Perkins Jacketed Mixers 200, 100, 50, 20, 9 & 0.7 gals. capacity; New and used Rotary Cutters; Rubber Mills; Calenders, Banbury Mixers, etc.; Heavy duty Mixers; Grinders; Pulverizers; Gas Boilers, etc. PARTIAL LISTING. WE BUY YOUR USED MACHINERY. STEIN EQUIPMENT CO., 90 WEST ST., N. Y. 6, N. Y. WOrth 2-5745.

FOR SALE Hydro Pneumatic Accumulator, 13 Gal. 3500#, Ball & Jewell Rotary Cutter. Model R and "T" Stokes Tablet Machines. 50 Ton Press with 18" x 18" Electric Plates, 100 ton 20" x 20" press. Racine Pumps, Boosters, Valves, Logan Pumps, Valves, Self-Contained—200 H.P. 78 Gal. 3000# Pump. 200 H.P. 200 Gal. 1500# Pump 18" x 15', Accumulator 1500#.—15" x 11' Acc. 400-2000#. 6" x 9' Accumulator-2000#. 300 Ton Press 20" Ram, 8" Stroke, 24" x 20" Platen. 500 Ton—1000 Ton Hobbing Press—Hele Shaw Variable Pressure 33 GPM 2500#—Vickers Oil Pumps 17 GPM 500 to 1000#. Elmes Horc. 4 Plunger 6—Gals. 5000#. Stillman 12" x 12" Laboratory Presses. Aaron Machinery Co., 45 Crosby St., NYC.

HYDRAULIC PRESSES BUILT to specifications for Plastic Items. Record Presses, producing two per min. We have in the used equipment (1) 1000 ton 30 x 30, 20" ram, 14" stroke, 24" day-light $1800. (1) 600 ton 40 x 48, 18" ram, 36" stroke, 12' day-light $2200. (1) 500 ton 22 x 48, 18" ram, 24" stroke, $1800. (1) 400 ton 23 x 30, 16" ram, 18" stroke, day-light 36" $1500. (2) 200 ton, 42 x 46, 12" ram, 36" stroke, 48" day-light $1200 each (2) 30 ton, 11-½ x 11-½, 10" ram, 10" stroke, 3 post downward acting self-contained $1000.00 each. Sal's Press, 386-390 Warren Street, Brooklyn 2, New York. MAin 4-7847.

WANTED TO PURCHASE
all types of plastic scrap, particularly
VINYL & POLYETHYLENE
INDUSTRIAL BURLAP & TEXTILE COMPANY
1128 Spring Street, Elizabeth, New Jersey.

IF YOU HAVE GOOD HYDRAULIC PRESSES with modern pumping equipment for sale send me your specifications of same with photo, and I will see to it that you will get the best price available. Sal's Press, 386-390 Warren Street, Brooklyn 2, New York.

FOR SALE—1—Watson Stillman Hydro-Pneumatic High and Low Pressure Accumulator System, complete; 1—Van Dorn Experimental Injection Molding Machine; Other Injection Molders up to 22 oz; 2—150 Ton Semi-Automatic Self-Contained Hydraulic Presses; 1—Royle #½ Plastic Extruder 1½" cylinder, other up to 8" cylinders; Two Roll Compounding Mills 6 x 12" up to 22 x 60"; Complete equipment for manufacture of molding powders. Send us your inquiries. CONSOLIDATED PRODUCTS CO. INC., 13-14 Park Row, New York 7, N. Y.

INDUSTRIAL DESIGNER—Stylist with creative ability, experienced in production and product development in compression and injection molding, sheet forming and casting resins, desires connection with molder, fabricator or progressive manufacturer of products in which plastics play an important part. Free lance or part time basis. Chicago area preferred. Reply Box C744, Modern Plastics.

SAVE WITH GUARANTEED REBUILT EQUIPMENT-HYDRAULIC PRESSES; 30" x 30", 20" ram, 1000 tons, 36" x 36", 19" ram, 425 tons; 30" x 30", 17" dia. ram, 310 tons, 24" x 24", 18" ram, 382 tons; 42" x 42", 16" ram, 250 tons; 30" x 30", 16" ram, 300 tons; 36" x 52", 14" ram, 385 tons; 24" x 24", 14" ram, 192 tons; 36" x 36", 13" ram, 111 tons; 24" x 24", 12" ram, 141 tons; 24" x 26" 10" ram, 118 tons; 20" x 20", 10" ram, 118 tons; 19" x 24", 10" rams, 78 tons; 22" x 15", 8" rams, 75 ton, 15" x 15", 8" ram, 75 tons; 12" x 12", 7⅛" ram, 50 tons; 12" x 12", 6½" ram, 42 tons; 8" x 9½", 4½" ram, 20 tons; 16" x 16", 3½" ram, 12 tons; PUMPS; NEW DUAL PUMPING UNITS, all sizes, Worthington Triplex 12 gal. 2200#; 4 plunger, 6 gal. 2000#; Watson Stillman Duplex Box type 1 gal. 2500#, Worthington 1 gal. 10000#; NEW LABORATORY 6" x 12" M.D. MILLS; Thropp 16" x 40" M. D. MILL; Extruders; Plastic, NRM size 1½ and 2½ Units; Preform Machines; Stokes R and T, Colton 5 and 5½ T; Mixers; Accumulators, Vulcanizers, etc. UNIVERSAL HYDRAULIC MACHINERY COMPANY, 285 Hudson St., New York 13, New York.

LARGE EASTERN PLASTICS manufacturer has opening for technically trained young man to head sales development work on plastic compounds for extrusion, injection and compression molding. Salary dependent on knowledge of plastic field and experience in production of molded products. Reply Box C861, Modern Plastics.

PLASTIC CRUSHERS
FOR SALE
5-Double Roll Saw Tooth Crushers.
Sprout-Waldron. Feed Hopper 16" x 16", 8 to 15 HP required; V-belt drive, excellent condition.
CONSOLIDATED PRODUCTS CO. INC.
13-14 Park Row New York 7, N. Y.

WANTED: Plastic fabricator desires business relationships with reliable firms. Specializing in display work but no limit to what type of product capable of turning out. Conscientious and thoroughly experienced partners working on very low over-head in small town. Well established but lack proper contacts. Reply Box C862, Modern Plastics.

FOR SALE
2½" NATIONAL RUBBER EXTRUDER U. S. varidrive motor, adjustable speed, motor driven conveyor, oil heating control.
3¼" HARTIG ELECTRIC EXTRUDER with 3 control units, conveyor and stand.
Reply Box C863, Modern Plastics.

SALES REPRESENTATIVES WANTED: First class manufacturer wants to secure the services of several good men who call upon fabricators of articles made of plastic film, such as raincoats, aprons, bibs, garment bags, draperies, etc., to sell them patented labels made of such film, beautifully printed, suitable for electronic application. Reply Box C864, Modern Plastics.

FOR SALE: 145,000 white ethyl cellulose discs, 17½" diameter, 5" center hole, .030 gauge. Good stock for printing, stamping or forming small parts. Sacrifice price. Sample on request. All or part subject to prior sale. Reply Box C865, Modern Plastics.

DIRECTOR OF RESEARCH—Plant Manager B.S., CHE., M.S., CH.E. 17 years experience with one firm. Synthesis, production and application of resins of many types. Phenolics liquid and cast; styrene powders and liquid, acrylic castings, polyesters, etc. Familiar with labor problems, production, engineering techniques, plant designs. Available on reasonable notice. Reply Box C866, Modern Plastics.

REBUILT EQUIPMENT FOR SALE
Baker Perkins Heavy Duty 100-gallon Double Arm, Steam Jacketed Mixers.
Readco Heavy Duty 150-gallon Double Arm Steam Jacketed Mixers.
Stokes and Colton Rotary and Stokes Model T Single Punch Tablet Machines.
Mikro 24", 1-SH and Bantam Pulverizers, Jay Bee, Schutz-O'Neill, Stedman, Williams and Rietz Mills.
Package Machinery FA, FA2, Hayssen and Miller Automatic Wrappers.
Huhn, Wolfe and Ellis Steam and Gas Fired Dryers.
Many Other Items of Interest In Stock—Attractively Priced
Tell Us Your Requirements
UNION STANDARD EQUIPMENT COMPANY
318-322 Lafayette Street
New York 12, N. Y.

FOR SALE: One 2½" National Rubber Extruder used less than 3 months; 7 Cumberland Chopper, 1 Cumberland Grinder. 1 Laboratory Mill Roll, one 10 ft. Conveyor —All in excellent condition. Alpha Products, 33 Hermon St., Worcester, Mass.

SALE: PATENT RIGHTS for self acting Scouring Pad Holder, a practical Kitchen Utensil, and a unique rust proof combination, Fish Scaler and Tackle Holder, (Pat. Pend.) 100% Plastic Chain Store Items. Write for Particulars to:
Schwarzer Experimental & Manufacturing Co.
Pottstown, Penna.

LINES WANTED
Sales representative, New York, specializing in 5¢ to $1.00 items suitable for big Chain Stores, desires to contact manufacturers of plastic specialties, housewares, toys, notions, stationery or novelties. I have over 20 years experience, an extensive following, and can market your products in volume. Commission basis. Reply Box C867, Modern Plastics.

ANTWERP FIRM—injection moulders of small plastic objects requires agency or representation for Belgium or Benelux-countries of American plastic-injection compressions moulders. First class references. Several travellers. Reply to: PLASTCO pvba — Campenhoutstr. 13 Berchem/Antwerp — Belgium.

(Continued on page 184)

IT'S DUCK SOUP



TO PREVENT

REJECTS

Improper molding temperature is one of the common causes for rejects. It results in off colors, brittleness, soft centers and low tensile strength. The routine use of the Cambridge Mold Pyrometer will go a long way in avoiding the spoilage caused by off-temperature molds. It is an accurate, rugged instrument that instantly indicates the surface temperature of mold cavities so that the operator can control it.



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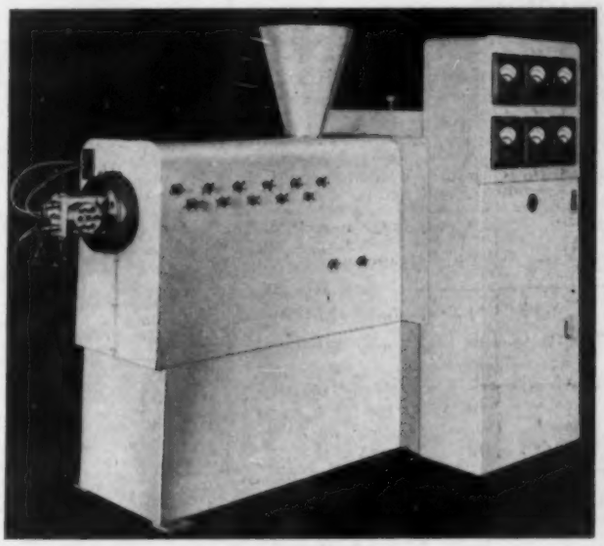
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modern plastic machinery corp. mpm

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CABLE ADDRESS MODPLAST

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Kew Bee Kut compound mixtures now being produced. It has more cutting qualities than the ordinary grades.

Square Kut Pegs****Italian Pumice, fine and lump grades. Write for particulars. National Sawdust Co., Inc., 82 N. 6th St., Brooklyn 11, N. Y.

FOR SALE: 1 eight cavity injection mold for a high quality, heavy, 5-inch pocket comb. This mold is practically new and in excellent condition. Mold was made by Guy P. Harvey and is adaptable to any machine. Full particulars and samples furnished on request. Reply Box C874, Modern Plastics.

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Sell your products to volume accounts through an established specialized sales force. Our merchandising, marketing and product development service assures maximum initial and continued volume sales. Reply Box C868, Modern Plastics.

AVAILABLE: INJECTION MOLDING SUPERINTENDENT, wide experience, excellent production record, thoroughly familiar with all phases of molding, Finishing & Assembly. Plant setup, Mold design, Maintenance. Capable organizer, would prefer to organize & manage new Injection Molding plant. Presently employed. Reply Box C871, Modern Plastics.

MANUFACTURERS AGENT

For Wisconsin and Upper Michigan Want to represent old established manufacturer of molded plastics. Have excellent, industrial and retail contacts. Commission basis. Reply Box C869, Modern Plastics.

WANTED:—MANUFACTURER OF MOLDED PLASTIC ARTICLES to take over prosecution of design patent application for small item of wearing apparel of possible interest to men and women. Assignment on reasonable royalty basis. Reply Box C872, Modern Plastics.

DISTRIBUTOR FOR WISCONSIN

Wish to represent manufacturers of plastic merchandise. Outstanding contacts with Wisconsin's finest retail stores. Commission basis. Reply Box C870, Modern Plastics.

SALES ENGINEER WANTED

Established custom injection molding plant in Chicago area desirous of obtaining sales representation industrial areas of Detroit, Cleveland, Buffalo, New York, Philadelphia, St. Louis and Indianapolis. Have established accounts in some territories now. Prefer experienced plastic man or salesman with contacts and engineering background. Excellent factory cooperation. Complete tool room, engineering and designing. Also assembly, painting and finishing. Machines up to 40 oz. capacity. Reply Box C873, Modern Plastics.

NEW PATENTED POCKET TOOTHBRUSH

Will sell outright or on royalty basis. Great possibilities for right company. For information write:

Hubert A. West
400 S. Maguire
Warrensburg, Mo.

POLYSTYRENE WANTED. Odd lots, scrap or lumps uncontaminated. Reply Box C876, Modern Plastics.

ENGINEER-WRITER — Available shortly for responsible position as "write" arm of sales or adv. mgr. Can create and develop profit-wise sales promotion, products publicity, public relations. ChE grad., 30, exp. in plastics, prep. of handbooks, sales letters, speeches, direct mail — words that do the job! East Coast pref. Reply Box C875, Modern Plastics.

FOR SALE: 5—Farrell-Birmingham rubber mills, 22" dia. x 60" face, top cap frames, each mill individually motor driven with enclosed reduction gear drive and 50 HP, 3 P., 60 C., 440 V. motor. 1—Farrell-Birmingham 18" x 24" mixing mill with reduction gear drive and 50 HP AC motor. These units still in operation. Prices extremely low. Eagle Industries, Inc., 110 Washington St., New York 6, New York. DI 4-8364.

WANTED — COATING TOWER
for 48" Material. Will buy or rent.
100 miles from New York City.
Reply Box C878, Modern Plastics.

PLASTIC INJECTION MOLDING PRESS, 1 oz. Watson-Stillman complete with pump, push button electrical control, 2 H. P. three phase, 220 volt motors and Wheelco Indicating Heat Control. Purchased new 1947, used occasionally for experimental work and one short trial production run. Now operating in owners' plant. Replacement cost $1300. Price $895. HAZELLE'S MARIONETTES, 905 East 10th Street, Kansas City 6, Missouri.

SALES REPRESENTATION WANTED: Custom injection molder and extruder wants top quality representation in Massachusetts and Rhode Island. Commission basis. Reply Box C877, Modern Plastics.

WE ARE SET UP AS SALES REPRESENTATIVES in this area and are interested in several additional good lines to handle. We are also in a position to supervise service tests on your product under subtropical conditions; namely, solar heat, humidity, etc. Forthcoming rainy season and summer ideal for this. FLORIDA PLASTICS SALES COMPANY, P. O. Box 292, Tampa, Florida.

PLASTICS ENGINEER, 18 years experience in all phases of plastic manufacturing —compression, transfer, injection molding. Capable supervisor of Production Department, Engineering Department. Reply Box C886, Modern Plastics.

ALMOST NEW PLASTIC DISH MOLD

Will sell 16 cavity mold for novelty plastic dish at one half cost. Used short time, excellent condition — $3,000. Inquire Pur. Dept., G. F. Heublein & Bro., Inc., Hartford, Conn.

WANTED: PLASTIC TILE MOLDS. Describe condition, number of cavities, size and weight, price and submit sample if possible. Reply Box C879, Modern Plastics.

FOR SALE: 6 and 8 oz. Reeds, 2 and 7 oz. HPM Injection Presses, 1½ (new) and 2½" NRM Extruders, oil heated. Ovens, Granulators, Tumblers, Temperature Circulators. 20 and 100 tons Compression Press. 1—150 tons 24x24" Pl. self cont. Compress. Press. Preform presses: Kux 60 A, Colton 4½ and 5½ T. Justin Zenner, 833 W. Sheridan Road, Chicago 13, Ill.

FOR SALE—Two (2) #250-150 ton std. self-contained hydraulic presses, complete with time cycle control 1 minute change gears power housing slow close cooling coil stop collars and relief valve.

Main Motor AC 220 volts, 60 cycle, 3 phase
Controller AC 110 volts, 60 cycle, 1 phase

Nearly new. Price reasonable. Reply Box C880, Modern Plastics.

FOR SALE

Ethyl Cel molding powder—Pure virgin, original containers 5M lbs. tan—5M lbs. gray 25¢ per lb. Reply Box C887, Modern Plastics.

WANTED: Approximately 20 Oz. injection machine, modern design, well known make. Reply Box C881, Modern Plastics.

WANTED: Man thoroughly familiar with injection and compression molding. Wisconsin Company. Reply Box C882, Modern Plastics.

FOR SALE

Phenolic molding powder equipment for making 2000 lbs. phenolic molding powder per day including 100 gal. jacketed steel kettle complete with agitator, motor, gear reducer, pumps, vacuum ejector, reflux condenser, temperature and power recorders and controls, and quick opening valves. 3 hammer mills for grinding resin and sheeted material complete with cyclone separators, blowers and housing for cooling, and exhaust blowers and motors. Compressor, cooler, blower and duct. Ribbon type horizontal mixer, 600 lb. capacity, with damper and magnets. 2 sets 16 x 42" rolls with feeder, 50 H.P. motors, traps, steam regulators, reversing switch 80 cu. ft. vertical, rotating tumbling batch mixer with motor. For details contact Manager, General Research, Owens-Illinois Glass Company, 1700 N. Westwood, Toledo, Ohio.

FOR SALE: 20,000 single toggle ivory switch plates. These plates are made of luminescent polystyrene. Company has discontinued line. Will accept best offer. Contact Box C883, Modern Plastics.

FOR SALE: Clear VINYLITE sheets, 20" x 50" x .025". Immediate delivery from stock. For prompt service write Durra Products Company, 370 Monroe Ave., Memphis, Tennessee.

FOR SALE: Reconditioned F. J. Stokes Mach. Co. RD-4 rotary 16 punch perform presses, 10 ton pressure; Baker Perkins 15 gal. Vacuum Mixer double arm, jktd; W&P 100 gal. double arm jktd. mixer. PERRY EQUIPMENT CORP., 1529 W. Thompson St., Phila. 21, Pa.

9-OZ. HPM HOR. INJ. MOLDING MACH. available. Two years old. 1st-class operating condition. Can be seen in operation in Erie, Pa. STANLEY BERG & CO., 605 Commerce Bldg., Erie, Pa. (26-890). 411 Frick Bldg., Pittsburgh, Pa. (Gr 5490).

CELLULOIDS—Available for sale—Large quantities of sixty and one hundred and fifty gauge stock in blue, red, green, black, and pink cloud, below list price. K. STENZEL & SONS, INC., 21-29 Hudson St., New York 13, N. Y.

WANTED

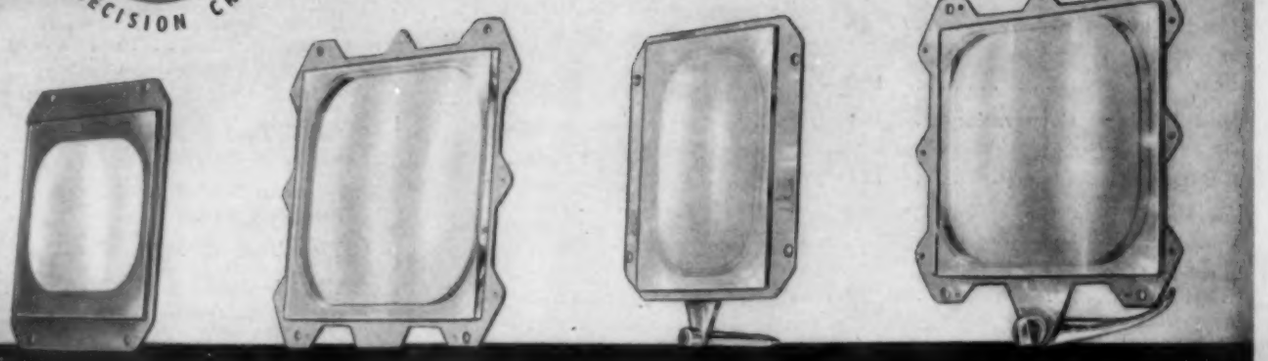
EXPERIENCED PLASTIC ENGINEER, familiar with extrusion and injection molding. Must have knowledge of die design, ability to handle men, and knowledge of organization. Good steady position. Reply Box C885, Modern Plastics.

MOULDS AND HUBS of discontinued lines wanted for cash. Household items of all descriptions; plastic toys such as rattles, cars, telephones, ships, boats, planes, notions, etc. Send description, weight and illustration of moulding. State details of mould or hub and price. Reply Box C884, Modern Plastics.

PLASTIC VINYL SCRAP — Bought and Sold. Flexible and Rigid. Sterns Plastic Products Co., 1686 Fulton St., Brooklyn 13, N. Y., PR 2-0215.

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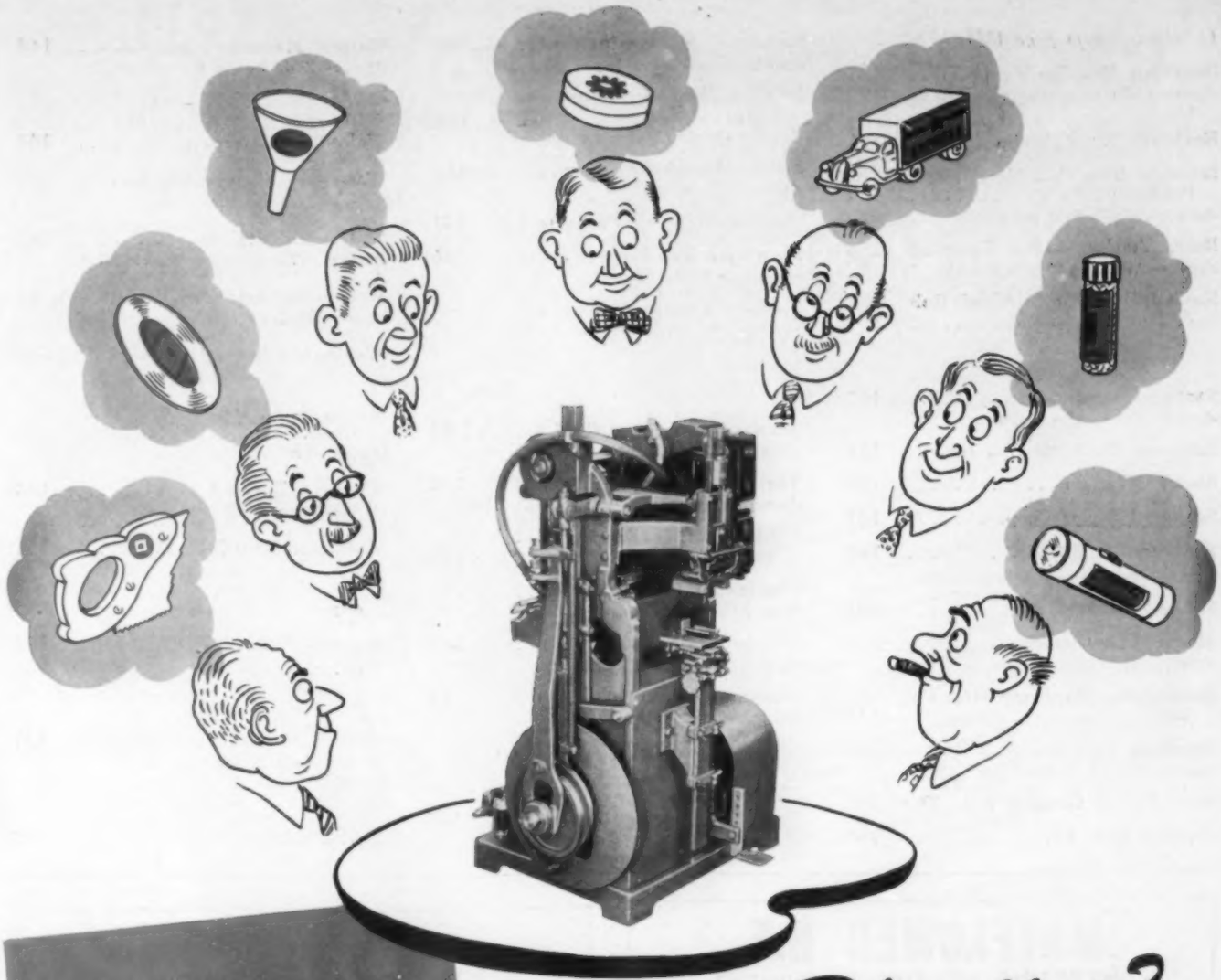
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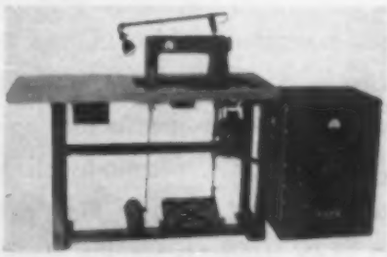
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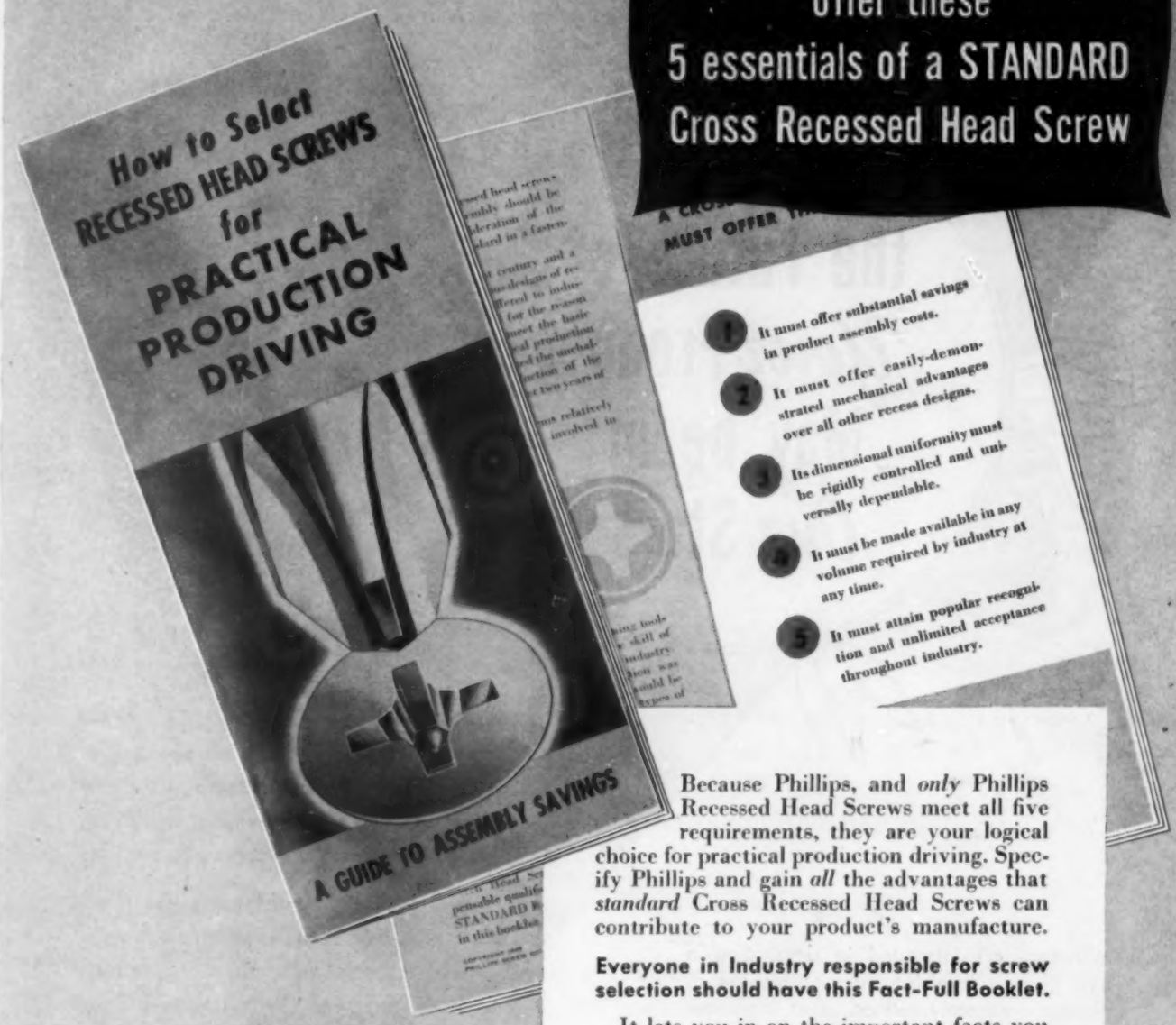
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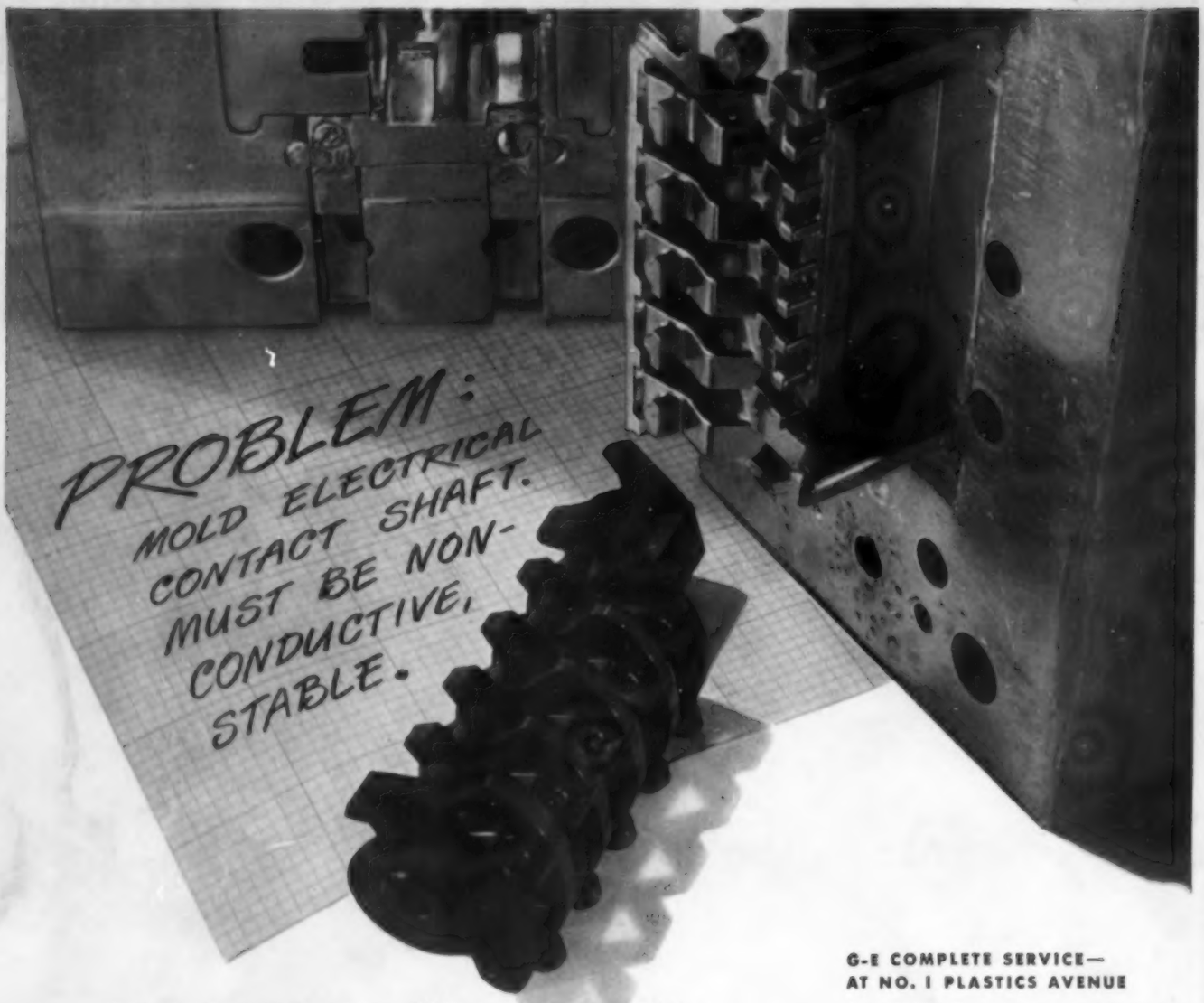
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